KENWOOD

SERVICE MANUAL

TR-9130

2m ALL MODE TRANSCEIVER

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CIRCUIT DESCRIPTION

Receiver Circuit Configuration

The front end employs a dual gate MOS FET Q1: 3SK76 and a helical resonator, L3. The first mixer (Q2: 3SK74), followed by a 2-stage MCF (Monolithic Crystal Filter) XF1, provides excellent two-signal characteristics and high sensitivity.

The IF signal from the MCF is applied to both SSB and FM circuits. The SSB signal, having passed through the NB (Noise Blanker) D7, D8 gate and crystal filter XF2 (10H2.2SD) is amplified by IF amplifiers Q11 – Q13 and demodulated into an audio signal by the product detector D10 ~ D13.

In the NB circuit, the signal from the MCF XFI is differential by Q3 and Q4 and is then applied to the second mixer, Q5. The noise signal, converted to a 455kHz signal, is limited by D2, D3, two-stage amplified by Q7, Q8 rectified by D4, D5, and operates the NB gate through Q10, a switch transistor. Q9 is the N.B. AGC amplifier. The NB on/off control is located on the front panel.

The AGC picks up the signal from the IF final stage Q13, amplifies the signal by Q14, rectifies this by D14, D15. It is then DC amplified by Q15, and the AGC voltage is applied to the three stages of IF amplifier Q11 – Q13: 3SK73 and the RF amplifier Q1: 3SK76. It is also used to drive the meter. Q17 is the signal meter amplifier, Q18 is the meter driver. The time constant is automatically selected according to the mode by Q16, D16: FAST for CW and SLOW for SSB.

The SSB squelch is a noise type utilizing an FM squelch circuit. The SSB IF signal is picked up from the AGC buffer amplifier Q14, amplified by Q19, and converted to a 455kHz signal by Q20. This signal is applied to the FM IF amplifier, effecting squelch on/off operation according to the noise level component above the normal 3kHz limit needed for voice communication in the same manner as the FM squelch operates. Thus, in SSB mode, the FM IF amplifier is also operated by this signal. The squelch on/off timing is controlled by Q29 – Q30 and C120. The scan stop signal for both SSB and FM is sent to the microprocessor.

In the FM circuit, the signal, having passed through the ceramic filter CFI CFW-455F (K/M type) or CFW-455E (W/T type), is amplified by IF amplifiers Q21: TA7060, Q22-23: 2SC1675(L), Limiter amplifiers Q24, 25: 2SC1675(L), then detected by ceramic discriminator L30 and diodes D27, 28.

In all modes, the detected AF signal is amplified by Q35: 2SC1815(Y), passed through the active LPF Q36: 2SC1815(Y) AF GAIN controlled, and power amplified by Q38: MB3713 to drive the speaker.

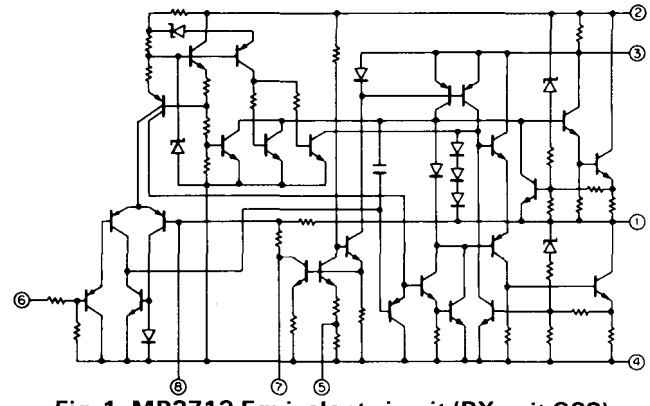


Fig. 1 MB3713 Equivalent circuit (RX unit Q38)

Item	Rating	
	CFW455E	CFW455F
Nominal center frequency	455 kHz	455 kHz
6 dB bandwidth	±7.5 kHz or more	±6 kHz or more
50 dB bandwidth	±15 kHz or less	±12.5 kHz or more
Ripple (within 455 ±5 kHz)	3 dB or less	3 dB or less
Loss	6 dB or less	6 dB or less
Guaranteed attenuation (within 455 ±100 kHz)	35 dB or more	35 dB or more
Input and output impedance	1.5 kΩ	2.0 kΩ

Table 1. Ceramic filter (L72-0315-05) CFW455F (K,M-type) (L72-0316-05) CFW455E (W,T-type) (RX Unit : CF1)

Item	Rating
Nominal center frequency (*fo*)	10.695 MHz
Center frequency	Within *fo* ±200 Hz at 6 dB
Pass bandwidth	2.2 kHz or less at 6 dB
Attenuation bandwidth	±1.5 kHz or less at 20 dB ±2.4 kHz or less at 60 dB
Ripple	Less than 2 dB
Loss	Less than 5 dB
Guaranteed attenuation	60 dB or more within ±40 kHz
Input and output impedance	600Ω ±10%/15 pF ±10%

Table 2. Crystal filter (L71-0215-05) 10H2.2SD (RX Unit : XF2)

Item	Rating
Nominal center frequency (*fo*)	10.695 MHz
Pass bandwidth	±7.5 kHz or more at 3 dB
Attenuation bandwidth	±25 kHz or less at 40 dB ±45 kHz or less at 60 dB
Guaranteed attenuation	1. 70 dB or more within ±1 MHz 2. Spurious level = 40 dB or more at *fo* ~ *fo* + 500 kHz 3. Spurious level = 80 dB or more at *fo* − (910 kHz ±10 kHz)
Ripple Loss	1.0 dB or less 1.5 dB or less
Impedance	3 kΩ/0 pF

Table 3. MCF (L71-0216-05) (RX Unit : XF1)

CIRCUIT DESCRIPTION

Transmitter Circuit Configuration

The signal from the microphone is amplified by Q1: 2SC2240(GR) which is common to both SSB and FM circuits. The SSB signal is fed to the RX unit, where it first passes through the SSB MIC GAIN trimmer VR5 is two-stage amplified by Q39 – 40: 2SC1815(Y), and then enters the balanced modulator D39 ~ D42 together with the carrier (10.695MHz) amplified by Q41. The modulator is balanced by VR7 and TC2, for minimum unwanted carrier in SSB. The resulting DSB signal from the modulator is buffer amplifier by Q42: 2SK61(GR) and is converted to an SSB signal after passing through the crystal filter. After one stage of amplification by Q44, this is applied to the transmitter balanced mixer Q5 – 6: 2SK61(GR) on the TX unit.

In the FM mode, the audio signal from the first mic amplifier Q1 is limiter-amplified by Q2: TA7061AP, then directly modulates the crystal oscillator (L2) output at 10.695 MHz Q3 is the Oscillator, and Q4 an emitter follower. Audio is applied to varactor diode D1: 1S2208. The subsequent circuit configuration is common in all modes. The signal, having passed through the TX mixer Q5, Q6 is band-pass filtered to remove the unwanted spurious signal component.

The BPF is tuned by varactor diodes D3 ~ D6, controlled by the PLL (phase-locked loop) VCO (voltage-controlled oscillator) correction voltage. The BPF output is amplified by Q7: 3SK74(L) (also tuned from the PLL by D7), and drives the final unit via Q8: 2SC2538. D8 provides bias stabilization for Q8.

The ALC samples the signal output from the driver Q8. This is rectified by diodes D9, D10 and amplified by Q9: 2SC2603(E), and applied to both the second gate of the predriver Q7 and IF amplifier Q44. The source voltage of predriver Q7 is controlled for HI/LOW power switching and protection operation in FM/CW mode.

For CW keying, the B + line to the transmitter balanced mixer is controlled through predriver Q21, which is controlled by switching Q20: 2SA1015(Y). CW break-in is performed by Q19 ~ Q16. At key-down, Q19 turns on to charge C79, which holds Q18 on (delay adjustment is VR7). Q18 then controls Q16, which switches the ST (PTT) line to ground, turning on the transmitter.

The signal, having entered the final unit, is power amplified by the power module M57727 and delivered to the antenna through the TX antenna switch diode D1: MI402 LPF (low pass filter) and protector directional coupler. The M57727 provides stable characteristics due to controlled power and idle current, IMD (intermodulation distortion) and f-characteristic.

Item	Symbol	Tc(°C)	Rated value
Operating voltage	Vcc	25	17V
Current consumption	Icc	25	10A
Operating case temperature	Tc(op)	–	–30 ~ +110°C
Storage temperature	Tstg	–	–40 ~ +110°C
Base bias voltage	VBB	25	10V

Table 4. Power module M57727 (V30-1239-86)

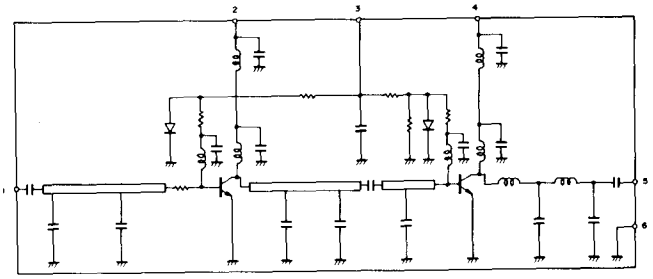


Fig. 2 Power module M57727 Equivalent circuit

PLL Circuit (X50-1860-00)

Fig. 3 shows the basic configuration of the PLL circuit. The signal generated by the VCO (Q9: 2SK19 (GR)), after passing through the buffer amplifiers Q10: 2SC1923(O) and Q11: 2SK61(GR), is mixed with the HET (heterodyne) signal by Q12: 2SC1923(O) where it is converted to a 5.5 to 9.49 MHz (K,M), 7.49 MHz (W,T) signal. This signal is amplified by Q3 – Q5: 2SC1675(L) and applied to Q6: TC9125BP. IC Q6 functions as a phase comparator, frequency-divider, and program counter. It compares the phase of the data (1 Mz, 100 kHz, 10 kHz) from the control unit with the phase of the 10 kHz reference signal obtained by dividing down the 9 MHz crystal oscillator. Any error from the reference is output from Q6 as a correction voltage for the VCO. This voltage, having passed the active low-pass filters Q7 and Q8, is applied to the VCO varactor diode to control the VCO Q9.

The 14.2 MHz component of the VCO HET signal is generated by the crystal oscillator Q1: 2SC1675(L) and the signal is multiplied to 127.8 MHz by D2: 1SS99 and input to the mixer Q2: 2SC1923(O).

The frequency of the crystal oscillator is controlled by D1: 1SV54GC. A DC signal corresponding to the 0 to 9.9 kHz signal from the control unit (X53-1210-11/62) is applied to this diode to vary the frequency in the 0 – 9.9 kHz range. The frequency shift in each mode is performed by the microprocessor, the output being f_{LSB} + 3.0 kHz for f_{USB}, and f_{LSB} + 1.5 kHz for f_{FM}.

CIRCUIT DESCRIPTION

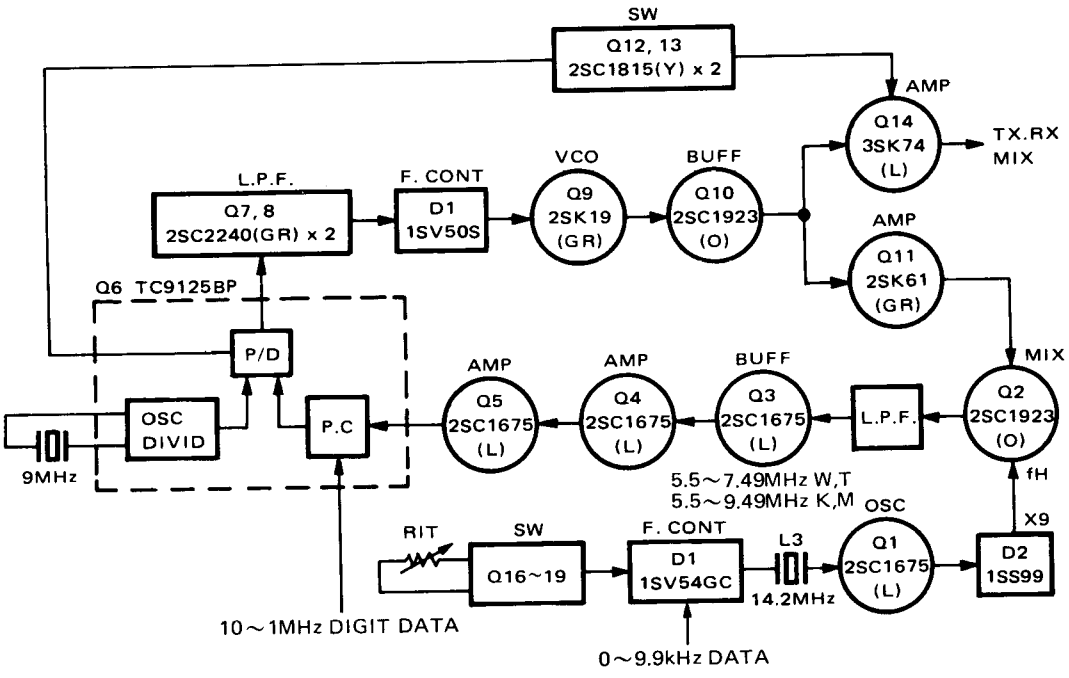


Fig. 3 PLL unit Block diagram

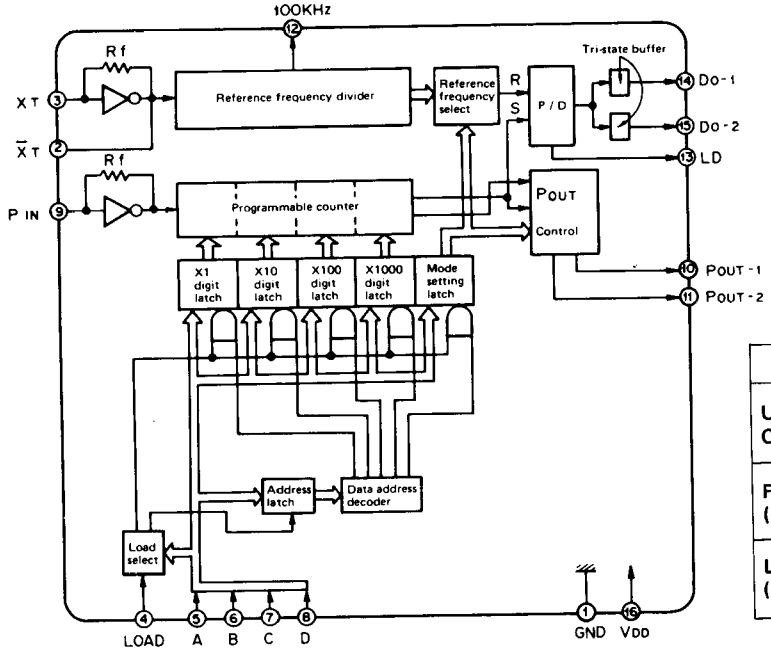


Fig. 4 TC9125BP Block diagram

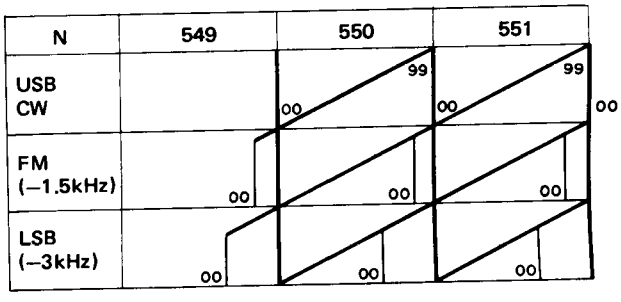


Fig. 5 0.0 ~ 9.9 kHz frequency changing

K,M type	fVCO	fIF	fHET	fHET/9	N
USB/CW	133.3065MHz ~ 137.3064MHz	5.5 MHz ~ 9.49MHz	127.8065MHz ~ 127.8164MHz	14.200722MHz ~ 14.201822MHz	550 ~ 949
FM	133.305 MHz ~ 137.305 MHz	5.49MHz ~ 9.48MHz	127.8065MHz ~ 127.8164MHz	14.200722MHz ~ 14.201822MHz	549 ~ 948
LSB	133.3035MHz ~ 133.3035MHz	5.4 MHz ~ 9.48MHz	127.8065MHz ~ 127.8164MHz	14.200722MHz ~ 14.201822MHz	549 ~ 948
W,T type	fVCO	fIF	fHET	fHET/9	N
USB/CW	133.3065MHz ~ 135.3064MHz	5.5 MHz ~ 7.49MHz	127.8065MHz ~ 127.8164MHz	14.200722MHz ~ 14.201822MHz	550 ~ 749
FM	133.305 MHz ~ 135.304 MHz	5.49MHz ~ 7.48MHz	127.8065MHz ~ 127.8164MHz	14.200722MHz ~ 14.201822MHz	549 ~ 748
LSB	133.3035MHz ~ 135.3034MHz	5.49MHz ~ 7.48MHz	127.8065MHz ~ 127.8164MHz	14.200722MHz ~ 14.201822MHz	549 ~ 748

Table 5. PLL frequency configuration

CIRCUIT DESCRIPTION

Control Circuit (X53-1210-11/62)

● Indicator

The indicator is a dynamic 5-digit LED display.

The D-port (pins 8-11) BCD data from the microprocessor Q12 is converted to 7-segment data by decoder driver Q11: SN74LS247N, which drives Q13 – 19: 2SA1115.

Data from the E- and F- ports (pins 12 – 16) sequentially switch the display through Q22 – 26: 2SC1959(Y), lighting the display. Control of the 100 Hz and 1 MHz digit decimals from the C3-port (pin 5) and F2-port (pin 18) is performed by Q20/28: 2SA1015(Y) and Q21/27: 2SC1815(Y).

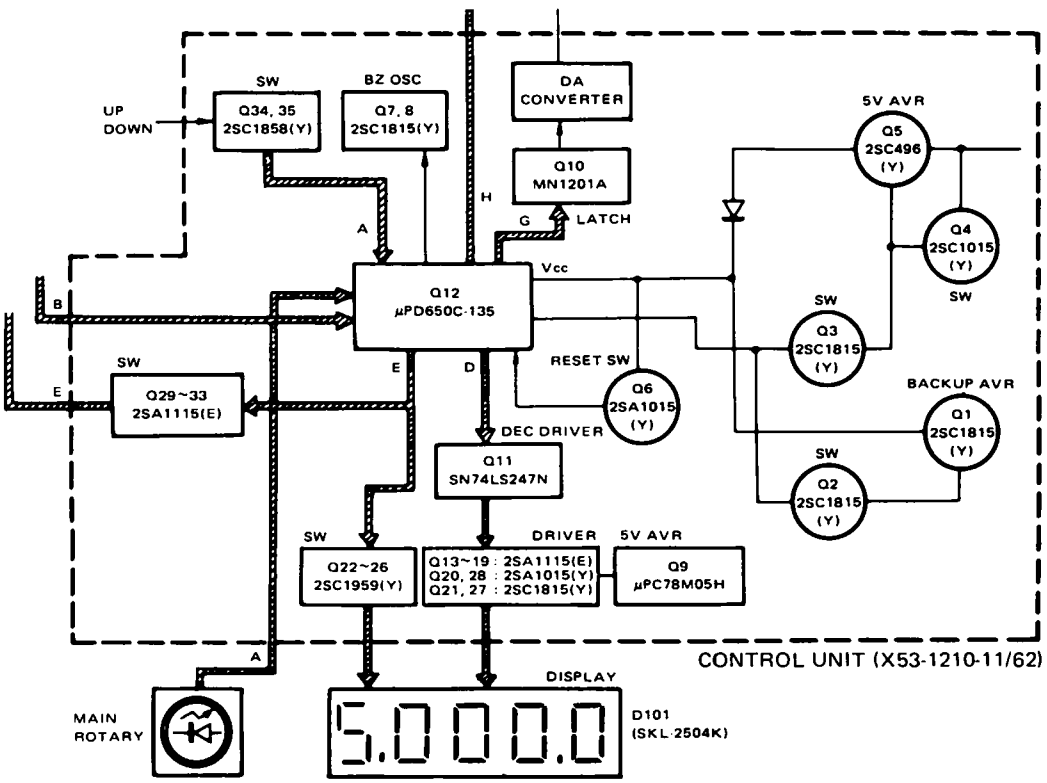


Fig. 6 Control unit Block diagram

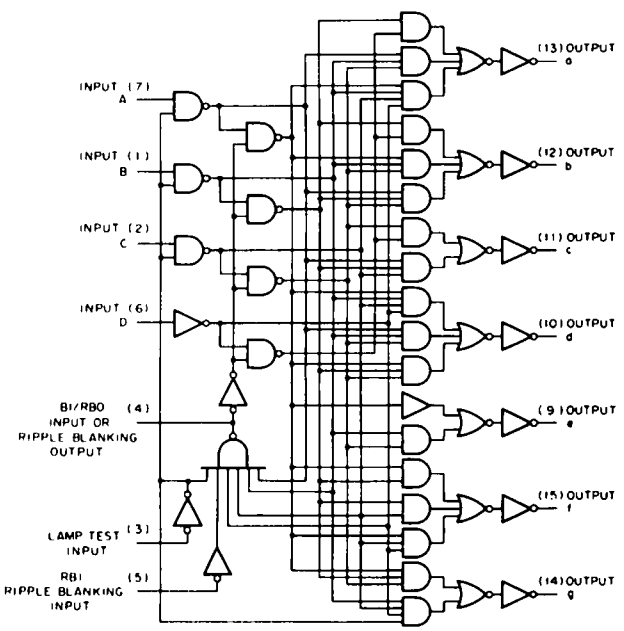


Fig. 7 SN74LS247N

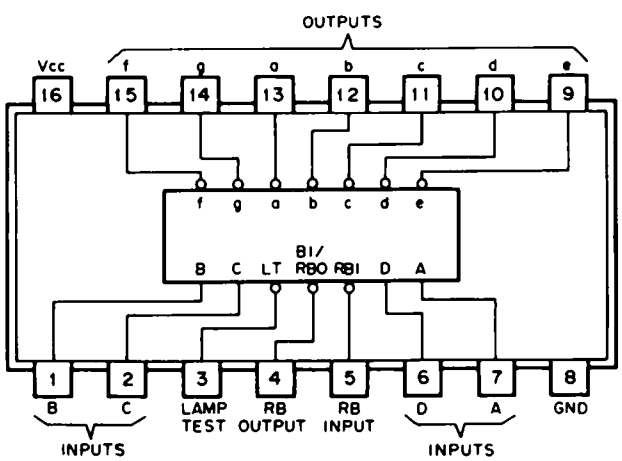
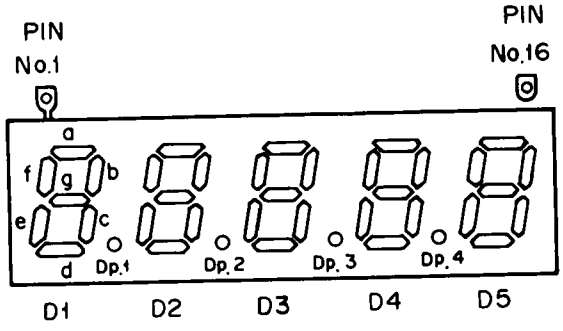


Fig. 8 SN74LS247N

CIRCUIT DESCRIPTION

● PLL Data Output

PLL data (3-digit: MHz, 100 kHz, 10 kHz) is dynamically out put from the microprocessor H0-H3 and I/O port. The 1 kHz/100 Hz data is applied from G0-G3 and F0/E3 ports to the dual latch Q10: MN1201A and converted to a DC voltage (HCV) associated with the D/A converter made up of fixed resistors (R49-R57).



Pin No.	Address	Pin No.	Address
1	D5 Cathode	9	g Anode
2	D4, Dp4 Cathode	10	b Anode
3	D3, Dp3 Cathode	11	a Anode
4	D2, Dp2 Cathode	12	f Anode
5	D1, Dp1 Cathode	13	Dp4 Anode
6	e Anode	14	Dp3 Anode
7	d Anode	15	Dp2 Anode
8	c Anode	16	Dp1 Anode

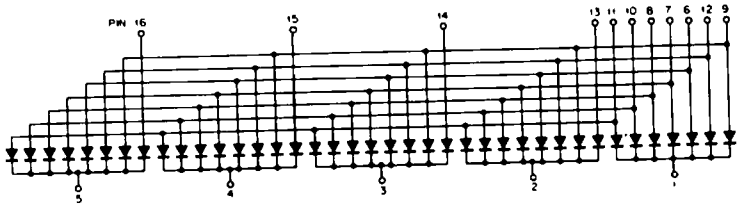


Fig. 9 5 digit LED SL-2504K

Symbol	Pin	Description
IN1 ~ IN4	Input	4-bit input terminal
AO1 ~ AO4	Output	Output terminal for data latched by clock pulse CKA
BO1 ~ BO4	Output	Output terminal for data latched by clock pulse CKB
CKA	Clock A	Clock signal terminal for latching 4-bit input signal in 4-bit flip flop A. Input signal is latched at the rising of clock signal.
CKB	Clock B	Clock signal terminal for latching 4-bit input signal in 4-bit flip flop B. Input signal is latched at the rising of clock signal.

Table 6. Terminals of the MN1201A

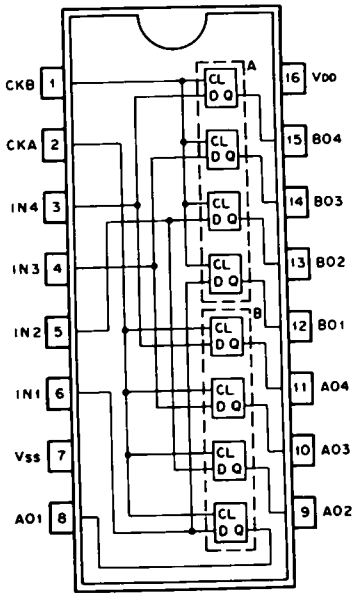


Fig. 10 MN1201A block diagram

● Reset Circuit

Lambda diode D7 (MA522(Q)) is used to detect the power supply voltage: when the power supply voltage exceeds the valley voltage (about 3.5 V) of the lambda diode, the diode is OFF and Q6 (2SA1015(Y)) is ON so that an "L" level signal is applied to the reset terminal (pin 7) of the microprocessor to reset it.

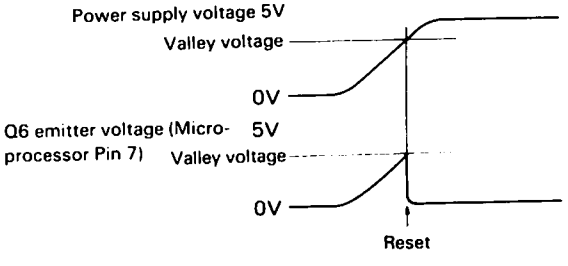


Fig. 11-A Reset timing

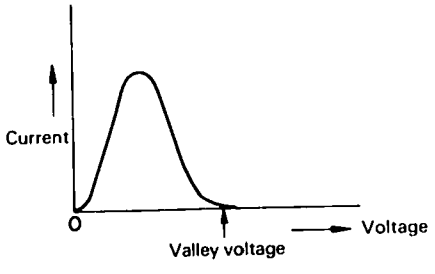


Fig. 11-B Lambda diode characteristics

CIRCUIT DESCRIPTION

● Switch Circuits

The individual switch circuits perform their functions by the output from the microprocessor E- and F-ports (pins 12 – 16) and B-port (pins 37 – 40) for input. Diodes (1S1555) are provided where necessary for isolation.

The pulsed output from the E- and F-port is shut off by Q29 – Q33 (2SA1115(Y)) during transmission, thereby improving the S/N ratio during transmit.

● Power Supply for the Control Circuit

There are three power supply circuits incorporated in the control unit: one for the LED display (5V), consisting of Q9 (μPC78M05H); one for back-up, consisting of Q1 (2SC1815(Y)); and one for the microprocessor, consisting of Q5 (2SC496(Y)).

When power is fed to the power connector with the power switch OFF, the back-up power supply operates to maintain the microprocessor memory. At this time, all ports are at the "L" level and the power consumption is minimum. When the power switch is ON, the other power supply circuits operate and the back-up power supply is turned off by the control signal from the microprocessor.

● Encoder and UP/DOWN Inputs

Fig. 12 shows the output signal from the encoder (50 steps per rotation). This signal is used to discriminate UP and DOWN counts within the microprocessor. The UP counts starts when U/D is H level at the down edge of the clock signal, and the DOWN count when U/D is L level.

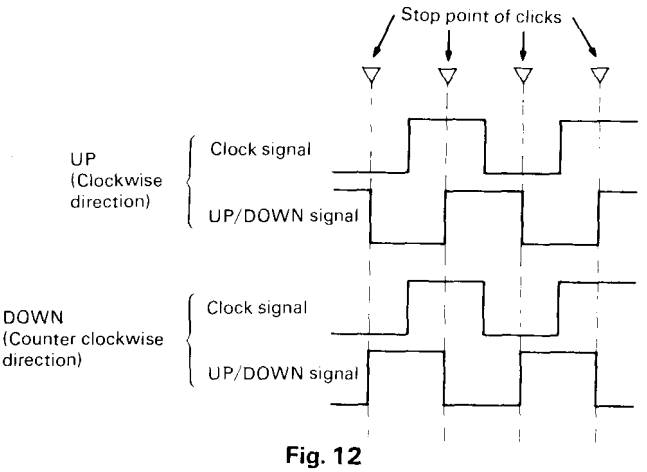


Fig. 12

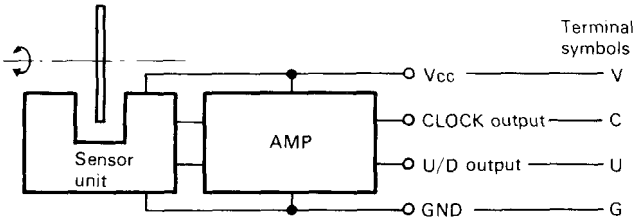


Fig. 13 Rotary encoder (W02-0308-05)

● Tone Oscillator Circuit

When the output for the microprocessor tone oscillator is H level, Q7 (2SC1815(Y)) is energized, allowing a current to flow into the piezo-electric buzzer oscillator, Q8 (2SC1815(Y)), producing a tone.

Terminal No.	Terminal name	Input Signal	Output Signal	Description	Pulse
1	CL1			Clock signal 400 kHz	
2	PC0	○		TX detection (When RX, it is L and when TX, it is H.)	
3	PC1	○		BACK UP detection (Normally H. When B.U, it is L.)	
4	PC2	○		SQ detection (Normally L. When FM SQ MIN, it is H.)	
5	PC3		○	DOT output for 100 Hz Lights when H and goes out when L.	
6	$\overline{INT}$			Normally H	
7	RES	○		When H → L, reset.	
8	PD0		○	BCD DATA output for indication	○
9	PD1		○		○
10	PD2		○		○
11	PD3		○		○
12	PE0		○	1 MHz digit pulse (Matrix output in combination with B input and these pulses.)	○
13	PE1		○	100 kHz digit pulse	○
14	PE2		○	10 kHz digit pulse	○
15	PE3		○	1 kHz digit pulse	○
16	PF0		○	100 Hz digit pulse	○
17	PF1		○	In normal operation, it is H. In BACK UP operation, it is L.	
18	PF2		○	DOT output for MHz	
19	PF3		○	The buzzer sounds when it is H.	
20	TEST			Normally 5V	
21	Vcc			5V Power	
22	PG0		○	(D → A convergence)	○
23	PG1		○		○
24	PG2		○	BCD DATA output for MN1201	○
25	PG3		○		○
26	PH0		○	PLL unit TC9125BP pulse DATA (Normally L. The pulse DATA is output only when the frequency is changed.)	○
27	PH1		○		○
28	PH2		○		○
29	PH3		○		○
30	P10		○		
31	P11		○	TX inhibited Normally L	
32	P12		○	Normally L. When FM TX, it is H.	
33	PA0	○		Rotary encoder CLOCK signal input	
34	PA1	○		Rotary encoder UP/DOWN signal input	
35	PA2	○		MIC UP input Normally L and when UP, it is H.	
36	PA3	○		MIC DOWN Normally L and When DOWN, it is H.	
37	PB0	○		Matrix input in combination with E0 – F0.	○
38	PB1	○			○
39	PB2	○			○
40	PB3	○			○
41	Vss			Ground	
42	CL0			CLOCK signal 400 kHz	

Table 7 μPD650C-135 terminal function

PARTS LIST

CAPACITORS

CC 45 TH 1H 220 J
1 2 3 4 5 6

1 = Type ceramic, electrolytic, etc
2 = Shape round, square, etc
3 = Temp coefficient
4 = Voltage rating
5 = Value
6 = Tolerance

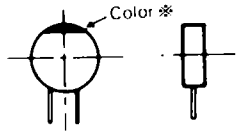
● **Temperature coefficient**

1st Word	C	L	P	R	S	T	U
Color ※	Black	Red	Orange	Yellow	Green	Blue	Violet
ppm °C	0	80	150	220	330	470	750

2nd Word	G	H	J	K	L
ppm °C	± 30	± 60	± 120	± 250	± 500

Example CC45TH 470 ± 60ppm °C

CC45



● **Rating voltage**

2nd word / 1st word	A	B	C	D	E	F	G	H	J	K	V
0	1.0	1.25	1.6	2.0	2.5	3.15	4.0	5.0	6.3	8.0	
1	10	12.5	16	20	25	31.5	40	50	63	80	35
2	100	125	160	200	250	315	400	500	630	800	—
3	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	—

● **Capacitor value**

0 1 0 1pF
1 0 0 10pF
1 0 1 100pF
1 0 2 1000pF 0.001μF
1 0 3 0.01μF
2 2 0 22pF

1st number | Multiplier
2nd number

● **Tolerance**

Cord	C	D	G	J	K	M	X	Z	P	No cord
(%)	± 0.25	± 0.5	± 2	± 5	± 10	± 20	+ 40 − 20	+ 80 − 20	+ 100 − 0	More than 10μF 10 ± 50 Less than 4.7μF 10 ± 75

Less than 10 pF

Cord	B	C	D	F	G
(pF)	± 0.1	± 0.25	± 0.5	± 1	± 2

Symbol	Destination
K	U.S.A.
W	Europe
J	Britain
M	General market

Resistors not listed in this parts list are standard, fixed carbon composition, 1/4W or 1/8W.
The resistance values, in ohms, are indicated on the schematic diagram.

Abbreviation		Abbreviation	
Cap	Capacitor	ML	Mylar
C	Ceramic	S	Styren
E	Electrolytic	T	Tantalum
MC	Mica		

N New parts
* Please note that these parts are sometimes not in stock and it take much time to deliver

SEMICONDUCTOR

Name		Re-marks	Part No.
Diode	1N60		V11-0051-05
	1S1555		V11-0076-05
	1S2588		V11-0414-05
	1SS99		V11-1277-86
	ITT410		V11-7761-86
	MA522 (R)		V11-1173-46
	MI303		V11-5273-66
	MI402		V11-5260-16
	U15B		V11-6460-26
Varistor	1S1212		V11-1262-06
	VD1223		V11-1262-46
Vari-cap	1S2208		V11-0317-05
	1SV50S		V11-1260-36
	1SV54-GC		V11-4173-46
LED	PR5532K		V11-7272-36
	PY5532K		V11-7272-46
	SL-2504K		V11-6178-36
	SLP-144B		V11-6172-56
	SLP-244B		V11-6172-66
Zener Diode	XZ-057		V11-4176-76
	XZ-060		V11-4101-20
	XZ-070		V11-4161-96
TR	2SA1012(Y, O)		V01-1012-36
	2SA1015(Y)		V01-1015-06
	2SA1115(D)		V01-1115-26

Name		Re-marks	Part No.
	2SA1115(E)		V01-1115-16
	2SA1115(D,E)		V01-1115-36
	2SC496(Y)		V03-0336-05
	2SC945(Q)		V03-0293-05
	2SC1675(L)		V03-1675-06
	2SC1775(E)		V03-1775-06
	2SC1815(Y)		V03-1815-06
	2SC1923(O)		V03-1923-06
	2SC1959(Y)		V03-1959-06
	2SC2240(GR)		V03-2240-06
	2SC2458(Y)		V03-2458-06
	2SC2538-22-A		V03-2538-16
	2SC2603(D,E)		V03-2603-16
	2SC2785(J,H)		V03-2785-40
	2SC2787(L)		V03-2787-16
FET	2SK19(GR) TR10-5		V09-1001-16
	2SK30A(GR)		V09-0060-05
	2SK30A(O)		V09-0056-05
	2SK61(GR)		V09-1014-06
	3SK73(GR)		V09-1002-46
	3SK74(L)		V09-1002-56
	3SK76-O		V09-1012-16
IC	AFG05F1750A2		V30-1141-26
	MB3713		V30-1233-16
	MN1201A		V30-1008-66

PARTS LIST

Name		Re-marks	Part No.
	NJM78L05A		V30-1149-06
	SN74LS247N		V30-1030-56
	TA7060P		V30-0087-05
	TA7061AP		V30-0039-05
	TC9125BP		V30-1232-26
	μPC78M05H		V30-0680-10
	μPC78M08H		V30-1222-16
Microprocessor	μPD650C-135		V30-1228-36
Power Module	M57727		V30-1239-86

GENERAL

Part No.	Re-marks	Description		Q'ty
A01-0924-03		Case (upper)		1
A01-0925-02		Case (lower)		1
A13 0612-02		Angle ass'y (right)		1
A13-0613-02		Angle ass'y (left)		1
A13-0614-04		Angle (top)		1
A20-2445 13	N	Panel		1
B01 0647-02	N	Panel escutcheon	K,W,M	1
B01-0648-02	N	Panel escutcheon	T	1
B03-0513-14		Switch mask (B) M, NB, A/B, RIT		4
B03 0518-04		Switch mask MHz, DS, MS, MR		4
B05-0713-04		Grill cloth, case (upper)		1
B05-0714-04		SP grill cloth		1
B05-0723 04	N	Grill cloth, case (lower)		1
B07-0621-03		Side escutcheon		2
B10-0640-04		Front glass		1
B30-0821-05		Meter lamp 8V, 70 mA		1
B31-0631-05		Meter		1
B40-2610 04	N	Model name plate	K	1
B40-2611-04	N	Model name plate	T	1
B40-2612-04	N	Model name plate	W,M	1
B46-0058-10		Warranty card	K	1
B50-3964-00	N	Instruction manual	K	1
B50-3965-00	N	Instruction manual	T	1
B50-3966-00	N	Instruction manual	W	1
B50-3983-00	N	Instruction manual	M	1
E06-0651-05		6P metal socket	MIC	1
E07-0651-05		6P metal consent	MIC	1
E09-0471 05		4P plug (accessory)		1
E12 0001 15		Phone plug (accessory)		1
E12 0401 15		STBY plug (accessory)		1
E23 0015-04		Earth lug (LED)		2
E29 0412-05		1P connector (male)		1
E29-0413-05		1P connector (female)		1
E30-1709-05	N	DC cord ass'y 7A		1
E31-2140-05	N *	Connector with lead SP		1
E91-0302-05	N	Battery snap (accessory)		1
F05-7025-05		Fuse (7A)		2
F10-1206-04		Earth plate Drive		1
F15-0622 04		Shadow mask (meter)		1
F15-0627 04		Shadow mask (LED)		1
F15-0635-04	*	Meter shadow mask		1
F20-0516-05		Insulating sheet (Q101)		1
F29-0014-05		Shoulder washer (Q101)		1
F29-0409-04	*	Insulating cushion (LED)		1
G02-0505-05		Knob fixed spring RIT, SQL		2
G13-0608-04		Cushion (upper case)		1
G13 0656-04	N	Battery cushion (accessory)		1
H01-4414-03	N	Carton (inside)	K,W,M	1
H01-4415-03	N	Carton (inside)	T	1
H10-2501-03		Styrene foam cushion		1
H10-2528-32		Styrene foam cushion		1
H25-0049-03		Accessory bag		1
H25-0077-03		Protective bag Battery holder		1
H25-0079-04		Protective bag MIC		1
H25-0103-04		Protective bag Cord		1
H25-0106-04		Protective bag TR-9130		1
J02-0069-05		Rubber foot		2
J02-0416-04		Foot (accessory)		1
J21-2754-04	N	Battery holder (accessory)		1
J25-2716-24	*	P.C. board SCAN		1
J25-3099-04	N *	P.C. board MODE		1
J25-3100-04	N *	P.C. board M. CH, MS		1
J25-3104-04	N	P.C. board SQL, H/LOW, TX OFFSET		1
J32-0198-14		Hexergon boss		5
J42-0409-04		Knob bush		1
J61-0019-05		Vinyl tie		1
K21-0749-03		Main knob		1
K21-0750 04		Knob (C) RF GAIN		1
K23-0727 04		Knob (A) MODE, M. CH		2
K23 0729-04		Knob (D) RIT, SQL		2
K23-0733-04		Knob (E) TX OFFSET		1
K23-0742-04		Knob VOL		1
K27-0408-04		Push knob (A) M, NB, A/B, RIT		4
K27-0409-04		Push knob (B) SCAN, HOLD		2
K27-0416-05		Push knob DS, MR, MS		3
K27-0425-05		Push knob (F) REV		1
K27-0430-04		Push knob TONE		1
K29-0762-04	N	Knob HI/LOW		1
N09-0256-05		Screw, earth		1
N13-0307-14		Ornamental nut VOL		1
N14-0512-05		Nut		4
N30 2004-46		Round screw MS		1
N30-2604-46		Round screw		10
N30-3006-46		Round screw Tr		1
N32-3005-46		Flat screw		10
N32-3006-46		Flat screw		5
N33-2606-45		Round flat screw SP		4
N33-3006-45		Round flat screw		19
N35-3004-46		Bind screw		8
N35-3006-46		Bind screw		10
N87-3006-46		Tap tight screw		10
N89-3005-46		Bind tap tight, Earth lug		2
R01-4411 05	N	Pot. 50K (B) with SW. SQL, H/L VR102		1
R05-3412-05		Pot. 10K (K) with SW. VOL VR101		1
R19-3406-05		Pot. 10K (B) x 2 RF, RIT, VR103,104		1
RS14AB3A121J		MF 120Ω 1W, R103		1

PARTS LIST

Part No.	Re-marks	Description		Q'ty
S01-2421-05		Rotary switch MODE		1
S01-2430-15		Rotary switch M.CH		1
S01-1421-05		Rotary switch TX OFFSET		1
S40-1401-05		Push switch MS		1
S40-2403-05		Push switch TONE	K,T,M	1
S40-2406-05		Push switch TONE	W	1
S40-2417-05		Push siwtch MR		1
S50-1406-05		Tact switch MIC		2
S59-1405-05		Key board switch SCAN, HOLD		2
T07-0216-05		Speaker		1
T91-0311-05		Microphone	T	1
T91-0313-05		Microphone	K,W,M	1
W02-0308-05		Rotary encoder		1
X41-1400-11	N	Switch unit		1
X41-1440-00	N	Mounting bracket assy		1
X45-1240-11	N	Final unit		1
X47-1090-11	N	Drive unit	K,M	1
X47-1090-61	N	Drive unit	W,T	1
X50-1860-00	N	PLL unit		1
X50-1870-11	N	CAR unit	K,M	1
X50-1870-51	N	CAR unit	T	1
X50-1870-61	N	CAR unit	W	1
X53-1210-11	N	Control unit	K,M	1
X53-1210-62	N	Control unit	W,T	1
X55-1320-00	N	RX unit	W,T	1
X55-1320-11	N	RX unit	K,M	1

Part No	Re-marks	Description	Ref No	Q'ty
SWITCH UNIT (X41-1400-11)				
CK45F1H103Z	C	0.01	C1	1
E23-0047-04		Square terminal		1
E40-0373-05		Mini connect wafer 3P		1
E40-0673-05		Mini connect wafer 6P		1
E40-0773-05		Mini connect wafer 7P		1
E40-1273-05		Mini connect wafer 12P		1
N30-2604-46		Round screw		1
R92-0150-05		Short jumper		2
S40-1403-15		Push switch M.SHIFT/ REV	S5	1 1
S40-1404-15		Push switch DS	S6	
S40-2404-05		Push switch A/B, RIT	S3,4	2
S40-2405-05		Push switch NB	S2	1
S40-2409-15		Push switch M	S1	1
FINAL UNIT (X45-1240-11)				
CC45CH1H010C	C	1pF	C5	1
CC45CH1H020C	C	2pF	C8	1
CC45CH1H330J	C	33pF	C16	1
CC45SL1H101J	C	100pF	C31	1
CC45SL2H070D	C	7pF 500V	C1	1
CC45SL2H100D	C	10pF 500V	C7	1

Part No	Re-marks	Description		Ref No	Q'ty
CC45SL2H101J	C	100pF	500V	C3	1
CC45SL2H120J	C	12pF	500V	C10	1
CC45SL2H220J	C	22pF	500V	C9	1
CC45SL2H330J	C	33pF	500V	C4	1
CC45SL2H390J	C	39pF	500V	C6	1
CE04W1A221M	E	220	10V	C26	1
CE04W1C220M	E	22	16V	C24,28	2
CE04W1H3R3M	E	3.3	50V	C18	1
CK45B1H102K	C	0.001		C11,12,14,15,17, 19,20,22,25,27, 29,30,32	12
CS15E1E010M	T	1	25V	C13	1
CS15E1VR47M	T	0.47	35V	C21	1
C90-0817-05	E	1000	16V (small)	C23	1
E04-0152-05		UHF type receptacle			1
E06-0252-05		2P square socket			1
E08-0304-05		Power jack Buck-up			1
E08-0471-05		4P socket AUX			1
E11-0405-05		KEY jack			1
E11-0406-05		STBY jack			1
E11-0409-05		Earphone jack			1
E23-0047-04		Square terminal			1
E23-0401-05		Roundterminal			2
E40-0373-05		Mini connect wafer 3P			1
E40-0673-05		Mini connect wafer 6P			1
F01-0775-05	N	Heat sink			1
L33-0649-05	N	Choke coil		L5	1
L34-0692-05		VHF coil 5φ4T		L3	1
L34-0742-05		Coil 3φ5T		L4,6	2
L34-0887-05		VHF coil 5φ3T		L7	1
L34-0908-05		Coil		L2	1
L34-1020-05		Coil 3φ3.5T		L1	1
L40-1001-03		Ferri-inductor 10μH		L8	1
N09-0256-05		Gnd screw			1
N30-2606-46		Round screw Back up			2
N35-3006-46		Bind screw PC board			6
N35-3008-46		Bind screw Power module			2
R12-0424-05		Trim. pot	100Ω (2 terminal)	VR3	1
R12-4411-05		Trim. pot	50kΩ	VR2	1
R12-5410-05		Trim. pot	100kΩ	VR1	1
RC05GF2H181J		Solid 180Ω	1/2W	R1	1
R92-0150-05		Short jumper			1
DRIVE UNIT (X47-1090-XX) 11: K/M, 61: W/T					
C05-0031-15		Ceramic trimmer 10pF		TC2,3	2
C05-0062-05		Ceramic trimmer 6pF		TC1	1
CC45CH1H030C	C	3pF		C62	1
CC45CH1H0R5C	C	0.5pF		C41,44	2

PARTS LIST

Part No.	Re-marks	Description	Ref. No.	Q'ty
CC45CH1H080D		C 8pF	C38	1
CC45CH1H100D		C 10pF	C23,57,63	3
CC45CH1H220J		C 22pF	C27,28,48	3
CC45CH1H390J		C 39pF	C26	1
CC45TH1H040C		C 4pF	C39,46	2
CC45TH1H050C		C 5pF	C40,42,43	3
CC45TH1H060D		C 6pF	C47	1
CC45TH1H100D		C 10pF	C35,36	2
CC45UJ1H020C		C 2pF	C19	1
CC45UJ1H120D		C 12pF	C18	1
CC45SL1H101J		C 100pF	C10	1
CC45SL1H221J		C 220pF	C20,21	2
CE04W1A221M		E 220 10V	C76	1
CE04W1A470M		E 47 10V	C4,7,11,16,72	5
CE04W1C101M		E 100 16V	C70,82,87	3
CE04W1C220M		E 22 16V	C86	1
CE04W1E4R7M		E 4.7 25V	C5,15	2
CE04W1H010M		E 1 50V	C3,6,12	3
CE04W1H3R3M		E 3.3 50V	C79	1
CK45B1H102K		C 0.001	C2,8,17,29–33, 49,51–53,56,58, 59,65–69,77,78, 80,84,85	25
CK45B1H222K		C 0.0022	C83	1
CK45B1H471K		C 470pF	C25	1
CK45B1H103Z		C 0.01	C24,34,45,54,61, 89,90	7
CQ92M1H103K		ML 0.01	C13	1
CQ92M1H332K		ML 0.0033	C9	1
CQ92M1H333K		ML 0.033	C14	1
CS15E1C1R5M		T 1.5 16V	C81	1
CS15E1VR47M		T 0.47 35V	C64	1
C90-0804-05		Cap. 0.001	C55,60	2
C90-0820-05		E 470 16V (small)	C71	1
C91-0131-05		C 0.01 (SP)	C1,22,73,73,88	5
C91-0456-05		C 0.047 (SP)	C37	1
C91-0457-05		C 0.022 (SP)	C50,75	2
E04-0154-05		Coax. connector		1
E23-0046-04		Square terminal		2
E40-0273-05		Mini connect wafer 2P		1
E40-0373-05		Mini connect wafer 3P		1
E40-0473-05		Mini connect wafer 4P		1
E40-0573-05		Mini connect wafer 5P		1
E40-0873-05		Mini connect wafer 8P		2
E40-0973-05		Mini connect wafer 9P		1
F20-0516-05		Insulating sheet		2
F29-0014-05		Shoulder washer Q10		1
L15-0016-05		Low frequency choke	L20	1
L31-0180-05		Tuning coil	L12	1
L31-0267-05		Tuning coil	L13,14	2
L31-0313-05		Tuning coil	L6	1
L33-0615-05		Choke coil 15μH	L3	1
L34-0452-05		VHF coil 3φ6T	L17	1
L34-0691-05		VHF coil 5φ5T	L18	1
L34-0886-05		Tuning coil 5φ5T	L11	1
L34-1043-05	N	VHF coil 5φ5T	L15	1

Part No	Re-marks	Description	Ref. No.	Q'ty
L40-1001-01		Ferri-inductor 10μH (small)	L8,9,19	3
L40-1001-03		Ferri-inductor 10μH	L10,16	2
L40-1011-03		Ferri-inductor 100μH	L21	1
L40-1021-03		Ferri-inductor 1mH	L4	1
L40-1092-14	N	Ferri-inductor 1μH	L7	1
L40-1541-27		Ferri-inductor 150mH	L1	1
L40-4711-03		Ferri-inductor 470μH	L5	1
L40-6825-04		Ferri-inductor 6.8mH	L22	1
L77-0859-05		Crystal 10.695 MHz	L2	1
N30-3006-46		Round screw		2
R12-0427-05		Trim. pot 500Ω	VR2	1
R12-1403-05		Trim. pot 1kΩ	VR6	1
R12-1417-05		Trim. pot 3kΩ	VR3	1
R12-2410-05		Trim. pot 5kΩ	VR1	1
R12-3437-05		Trim. pot 33kΩ	VR5	1
R12-5411-05		Trim. pot 100kΩ	VR4	1
R12-7404-05		Trim. pot 500kΩ	VR7	1
RC05GF2H2R2J		Solid 2.2Ω 1/2W	R47	1
R92-0150-05		Short jumper		9

PLL UNIT (X50-1860-00)

C05-0308-05		Ceramic trimmer 4pF	TC2	1
C05-0067-05		Ceramic trimmer 25pF	TC1	1
CC45PH1H070D		C 7pF	C39	1
CC45CH1H010C		C 1pF	C5	1
CC45CH1H030C		C 3pF	C44	1
CC45CH1H040C		C 4pF	C4,46	2
CC45CH1H0R5C		C 0.5pF	C12,13	2
CC45CH1H060D		C 6pF	C41,59	2
CC45CH1H070D		C 7pF	C14	1
CC45CH1H080D		C 8pF	C15	1
CC45CH1H100D		C 10pF	C16,50	2
CC45CH1H101J		C 100pF	C9,10	2
CC45CH1H150J		C 15pF	C43	1
CC45CH1H220J		C 22pF	C3,11,49	3
CC45CH1H330J		C 33pF	C24,25	2
CC45CH1H560J		C 56pF	C6	1
CC45SL1H101J		C 100pF	C19,21	2
CE04W1A101M		E 100 10V	C45	1
CE04W1A470M		E 47 10V	C7,22,61	3
CE04W1C100M		E 10 16V	C17,53	2
CE04W1E4R7M		E 4.7 25V	C51	1
CE04W1H010M		E 1 50V	C38	1
CK45B1H102K		C 0.001	C26–29,36,47, 48,54,57	9
CK45B1H103K		C 0.01	C2,8,30,31,52, 55,56,58,62,63	10
CQ92M1H223K		ML 0.022	C20,32	2
CQ92M1H473K		ML 0.047	C35	1
CS15E1A2R2M		T 2.2 10V	C33,34	2
CS15E1VR47M		T 0.47 35V	C1	1

PARTS LIST

Part No	Re marks	Description	Ref. No.	Q'ty
C91-0457-05		C 0.02 (SP)	C18,23,37,60	4
E23-0046-04		Square terminal		3
E40-0473-05		Mini connect wafer 4P		1
E40-0673-05		Mini connect wafer 6P		1
E40-0873-05		Mini connect wafer 8P		1
L32-0624-05		OSC coil VCO	L13	1
L33-0648-05	N	Choke coil 4.7μH	L4	1
L34-0820-05		Tuning coil	L15	1
L34-0901-05		Tuning coil	L5,6	2
L34-2073-05	N	Tuning coil	L16	1
L40-1021-03		Ferri-inductor 1mH	L1,2,7,9	4
L40-1501-03		Ferri-inductor 15μH	L8	1
L40-3391-03		Ferri-inductor 3.3μH	L12,14	2
L40-4711-03		Ferri-inductor 470μH	L10,17	2
L77-0934-05		Crystal 9 MHz	L11	1
L77-0962-05	N	Crystal 14.20398 MHz	L3	1
R12-3416-05		Trim. pot 47kΩ	VR2	1
R12-6403-05		Trim. pot 470kΩ	VR1	1
R92-0150-05		Short jumper		1
CARRIER UNIT(X50-1870-XX) 11:K/M,51:T,61:W				
C05-0030-15		Ceramic trimmer 20pF	TC2, 3	2
C05-0031-15		Ceramic trimmer 10pF	TC1	1
CC45CH1H020C		C 2pF	C11	1
CC45CH1H220J		C 22pF	C2, 12	2
CC45CH1H270J		C 27pF	C1	1
CC45CH1H470J		C 47pF	C3	1
CC45SL1H221J		C 220pF	C9, 10	2
CE04W1C220M		E 22 W.T	C17, 18	2
CK45B1H102K		C 0.001	C14, 15	2
CK45F1H103Z		C 0.01	C4 - 8,13	6
CQ92M1H472K		ML 0.0047 W.T	C20	1
CS15E1A150M		T 15 T	C16, 21	2
CS15E1VOR1M		T 0 1 W, T	C19	1
E23-0046-04		Square terminal	K,M:4, W:1, T:3	
E40-0273-05		Mini connect wafer		1
E40-0773-05		Mini connect wafer 7P		1
L30-0281-15		Coil IFT	L5	1
L40-1021-03		Ferri-nductor 1mH	L1 – 4	4
L40-1511-03		Ferri-inductor 150μH	L6	1
L77-0856-05		Crystal 10.6943 MHz	L7	1
L77-0857-05		Crystal 10.6965 MHz	X1	1
R12-3521-05		Trim pot 20 kΩ W.T	VR1	1
R92-0150-05		Short jumper		1
CONTROL UNIT (X53-1210-XX) 11:K/M, 62:W/T				
CE04W1A101M		E 100 10V	C12,14	2
CE04W1A221M		E 220 10V	C2,9,10	3
CE04W1A470M		E 47 10V	C3,7	2
CE04W1A471M		E 470 10V	C8	1

Part No	Re marks	Description	Ref No	Q'ty
CE04W1C331M		E 330 16V	C1	1
CE04W1C470M		E 47 16V	C4,6	2
CK45F1H103Z		C 0.01	C5,13,15	3
CQ92M1H223K		ML 0.022	C11	1
E23-0047-04		Square terminal		1
E40-0373-05		Mini connect wafer 3P		2
E40-0573-05		Mini connect wafer 5P		2
E40-0673-05		Mini connect wafer 6P		1
E40-0873-05		Mini connect wafer 8P		2
E40-0973-05		Mini connect wafer 9P		1
G11-0605-04		Cushion BZ-1		1
J29-0403-04		Transducer plate		1
L30-0503-05		IFT	L1	1
N30-3006-46		Round screw		2
N35-3006-46		Bind screw		2
R12-1413-05		Trim. pot 1kΩ	VR1	1
RC05GF2H330J		Solid 33Ω 1/2W	R2	1
RS14GB3D150J		MF 15Ω 2W	R1	1
RN14BK2E1003F		MF 100kΩ 1/4W	R49,53	2
RN14BK2E2003F		MF 200kΩ 1/4W	R50,55	2
RN14BK2E4023F		MF 402KΩ 1/4W	R51,56	2
RN14BK2E4703F		MF 470kΩ 1/4W	R54	1
RN14BK2E8063F		MF 806kΩ 1/4W	R52,57	2
R90-0526-05		Resistor block 27kΩ x 4	R59,60	2
R90-0530-05		Resistor block 2.7kΩ x 4	R58	1
R90-0532-05		Resistor block 27kΩ x 5	R61	1
T95-0051-05		Transducer	BZ-1	1
RX UNIT (X55-1320-XX) 00: W/T, 11: K/M				
C05-0030-15		Ceramic trimmer 20pF	TC1	1
C05-0031-15		Ceramic trimmer 10pF	TC2	1
CC45CH1H020C		C 2pF	C14,68	2
CC45CH1H030C		C 3pF	C3,161	2
CC45CH1H040C		C 4pF	C79	1
CC45CH1H050C		C 5pF	C16,165	2
CC45CH1H0R5C		C 0.5pF	C12	1
CC45CH1H070C		C 7pF	C44	1
CC45CH1H100D		C 10pF	C55,66,81	3
CC45CH1H150J		C 15pF	C11,20,82	3
CC45CH1H220J		C 22pF	C4,62	2
CC45CH1H330J		C 33pF	C1,13,159,160	4
CC45CH1H470J		C 47pF	C49,86	2
CC45RH1H100D		C 10pF	C5	1
CC45RH1H120J		C 12pF	C2	1
CC45SL1H101J		C 100pF	C77,141,175	3
CC45SL1H151J		C 150pF	C22	1
CC45SL1H220J		C 22pF	C112,114	2
CC45SL1H470J		C 47pF	C40,69,72,84, 100	5
CE04W1A101M		E 100 10V	C140,145,172	3
CE04W1A470M		E 47 10V	C127,144	2

PARTS LIST

Part No.	Re-marks	Description	Ref. No.	Q'ty
CE04W1C100M		E 10 16V	C42,120,124, 136	4
CE04W1C330M		E 33 16V	C115	1
CE04W1C470M		E 47 16V	C151	1
CE04W1E4R7M		E 4.7 25V	C119,121,149	3
CE04W1H010M		E 1 50V	C36,74,137, 138,142,154	6
CE04W1H2R2M		E 2.2 50V	C118	1
CE04W1H3R3M		E 3.3 50V	C117	1
CK45B1H102K		C 0.001	C6,9,10,25,34, 45,129,166	8
CK45B1H222K		C 0.0022	C7,8,33,139	4
CK45B1H331K		C 330pF	C27,70	2
CK45B1H471K		C 470pF	C23,94,98,99, 103,104,174	7
CK45F1H103K		C 0.01	C15,17,18,24,30, 35,38,43,52,61, 76,78,95,96,147, 153,158	17
CQ92M1H102K		ML 0.001	C107,108	2
CQ92M1H103K		ML 0.01	C91,113,125, 134,135	5
CQ92M1H104K		ML 0.1	C65	1
CQ92M1H123K		ML 0.012	C131,132	2
CQ92M1H153K		ML 0.015	C64	1
CQ92M1H183K		ML 0.018	C122	1
CQ92M1H222K		ML 0.0022	C101,105,109, 111,116	5
CQ92M1H223K		ML 0.022	C92,93,97,106	4
CQ92M1H332K		ML 0.0033	C126	1
CQ92M1H393K		ML 0.039	C110	1
CQ02M1H683K		ML 0.068	C148	1
CS15E1C4R7M		T 4.7 16V	C133	1
CS15E1E010M		T 1 25V	C73	1
CS15E1V0R1M		T 0.1 35V	C128,130	1
C90-0820-05		E 470 16V (small)	C146	1
C90-0824-05		E 1 50V (small)	C150,152	2
C90-0834-05		E 0.15	C143	1
C91-0131-05		C 0.01 (SP)	C19,26,63,162, 171	5
C91-0456-05		C 0.047 (SP)	C28,29,31,32, 37,89,90,102	8
C91-0457-05		C 0.022 (SP)	C21,39,41, 46–48,50,51,53, 54,56–60,67,71, 75,80,83,85,87, 88,155–157,163, 164,167–170, 173	33
C91-0460-05		C 0.068	C123	1
E04-0154-05		Coax. connector		1
E23-0046-04		Square terminal		5
E40-0211-05		Pin connector		1
E40-0273-05		Mini connect wafer 2P		3
E40-0373-05		Mini connect wafer 3P		2
E40-0473-05		Mini connect wafer 4P		1
E40-0573-05		Mini connect wafer 5P		1
E40-0773-05		Mini connect wafer 7P		1
E40-0973-05		Mini connect wafer 9P		1

Part No.	Re-marks	Description	Ref. No.	Q'ty
E40-1073-05		Mini connect wafer 10P		2
E40-1273-05		Mini connect wafer 12P		1
L30-0005-05		IFT	L7,8,26	3
L30-0281-05		IFT	L14,18	2
L30-0289-05		IFT	L16,17	2
L30-0503-05		IFT	L10,12,22	3
L30-0504-05		IFT	L13,21	2
L30-0507-05		IFT	L15	1
L30-0513-05		IFT	L6	1
L30-0515-05	N	IFT	L29	1
L31-0267-05		Tuning coil	L1,2	2
L33-0002-05		Choke coil 1μH	L4	1
L34-0683-05		Tuning coil	L5	1
L40-1011-03		Ferri-inductor 100μH	L19	1
L40-1011-14		Ferri-inductor 100μH	L31	1
L40-1021-03		Ferri-inductor 1mH	L20,24,32	3
L40-1501-03		Ferri-inductor 15μH	L11	1
L40-1511-03		Ferri-inductor 150μH	L25,28	2
L40-4711-03		Ferri-inductor 470μH	L27	1
L40-6825-04		Ferri-inductor 6.8mH	L23	1
L71-0215-05		Crystal filter	XF2	1
L71-0216-05		MCF	XF1	1
L72-0315-05		Ceramic filter CFW455F K,M	CF1	1
L72-0316-05		Ceramic filter CFW455E W,T	CF1	1
L77-0858-05		Crystal 10.24MHz	L9	1
L79-0446-05		Ceramic discri CFY455S	L30	1
L79-0468-05		Helical resonator W,T	L3	1
L79-0483-05		Helical resonator K,M	L3	1
N30-3004-46		Round screw		1
R12-0421-05		Trim. pot 100Ω	VR7	1
R12-0424-05		Trim. pot 100Ω	VR8	1
R12-1423-05		Trim. pot 3.3kΩ	VR2	1
R12-3416-05		Trim. pot 47kΩ	VR4	1
R12-3433-05		Trim. pot 30kΩ	VR3	1
R12-3434-05		Trim. pot 10kΩ	VR6	1
R12-4411-05		Trim. pot 50kΩ	VR5	1
R12-7404-05		Trim. pot 500kΩ	VR1	1
R92-0150-05		Short jumper		15

PACKING

Packing

★ : Protective bag (H25-0103-04)
- DC cord ass'y 7A (E30-1709-05)
- Foot (J02-0416-04)
- Accessory bag (H25-0049-03)
  - 4P plug (E09-0471-05)
  - Phone plug (E12-0001-15)
  - STBY plug (E12-0401-15)
  - Huse 7A (F05-7025-05)
  - Mounting bracket
    (Flange nut, Spring washer, Flat washer, Hex. wrench, Screw)
- Protective bag (H25-0077-04)
  - Battery snap (E91-0302-05)
  - Battery cushion (G13-0656-04) x 3
  - Battery holder (J21-2754-04)
  - Round flat screw (N33-3006-45) x 3

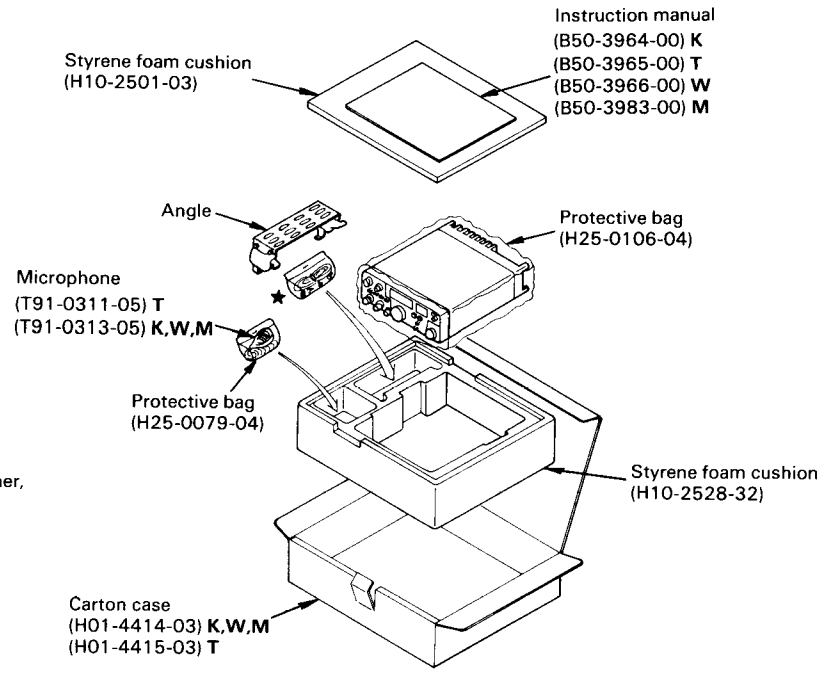


Fig. 14

Note for back up battery

1. This Ni-Cd cell is used to protect the memory when carrying the TR-9130 which can be used in your home or car. It is mainly used for memory back up for short times.
2. Please use a commercially available type 6F22 (9V) Ni-Cd battery. A manganese or alkali battery cannot be used.
3. Charging
   When the power of the TR-9130 is OFF, if the power of the battery, etc., is connected, it is possible to charge. The charging current is about 3 mAH, about 48 hours is required to fully charge the empty 75 mAH type 6F22 (9V) Ni-Cd battery pack.
4. Discharging
   Since the back up current of the TR-9130 is about 2.5 mA, the memory retention time is bout 24 hours. If you don't use the TR-9130 for a long time, remove the Ni-Cd battery pack connector.
5. Please refer to the instruction manual of the TR-9130 for installation.

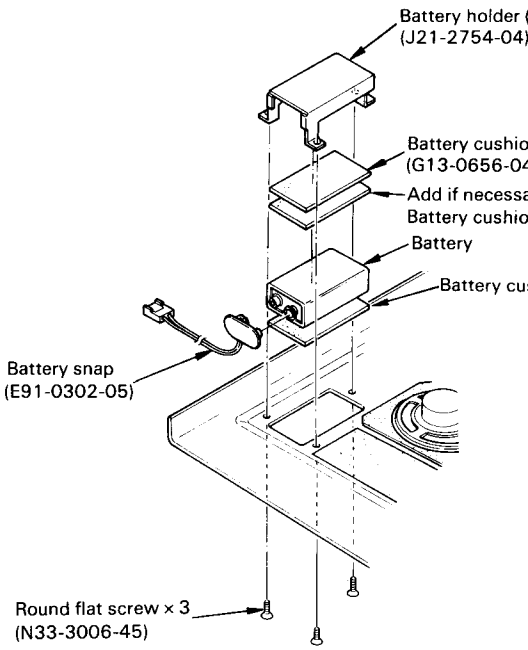


Fig. 15

DISASSEMBLY

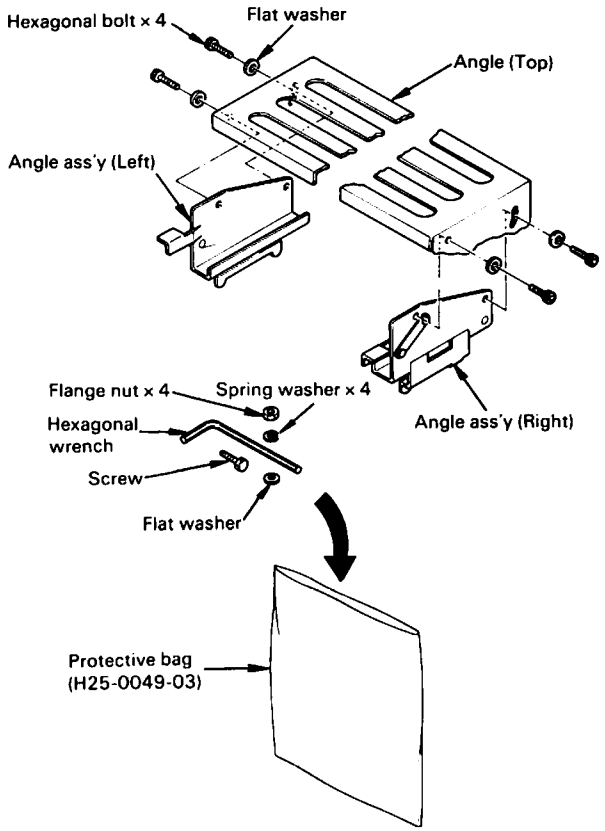


Fig. 16 Mounting bracket ass'y (X41-1440-00)

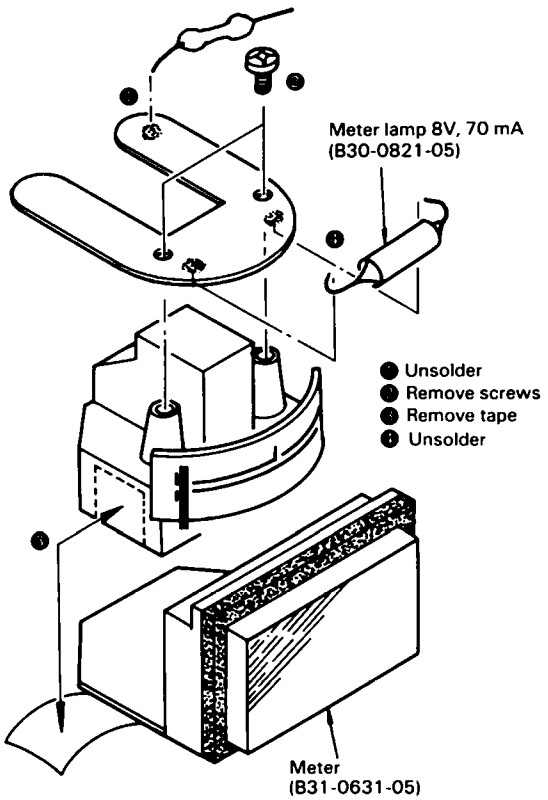


Fig. 17 Meter

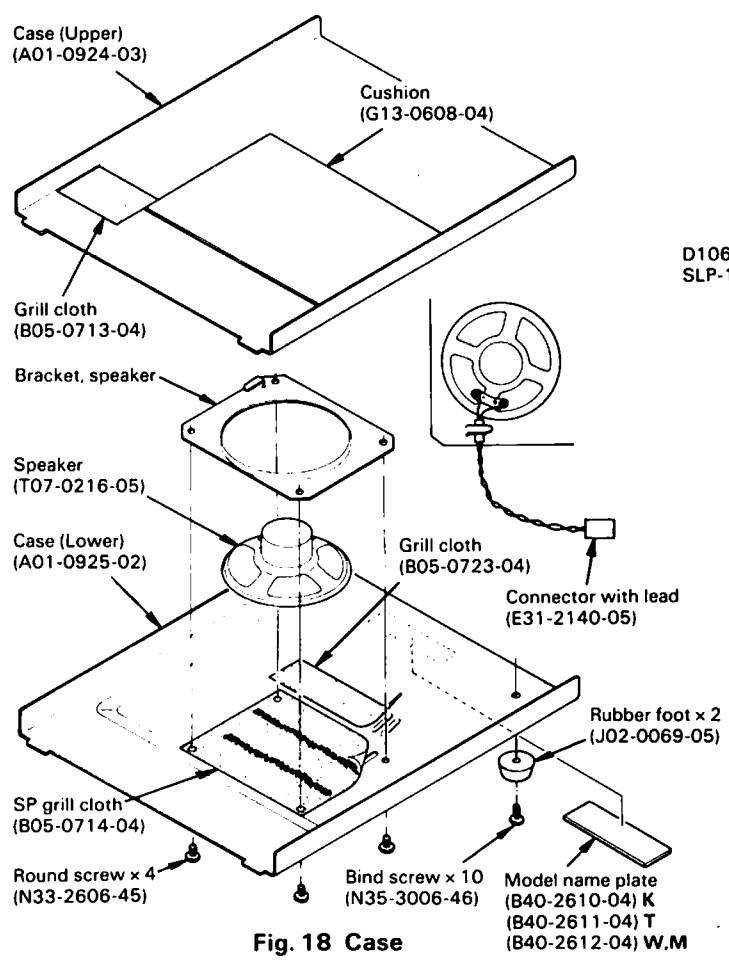


Fig. 18 Case

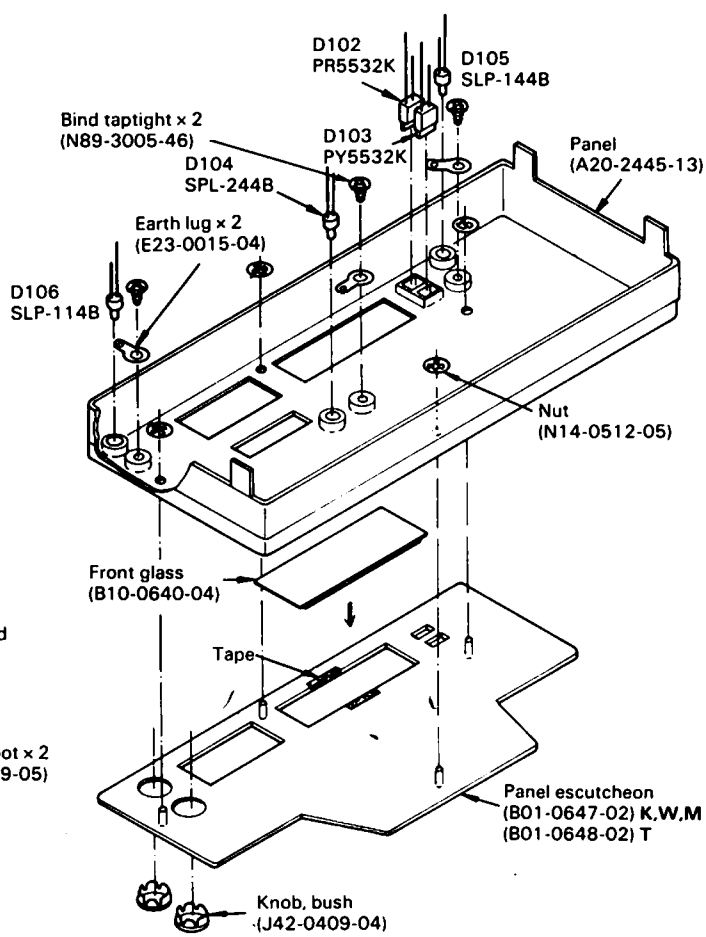


Fig. 19 Panel

DISASSEMBLY

Opening the case

Remove the five screws shown in the figure from the top and bottom of the case, then carefully lift it upwards. Be careful to avoid damaging the speaker leads, which are attached to the bottom.

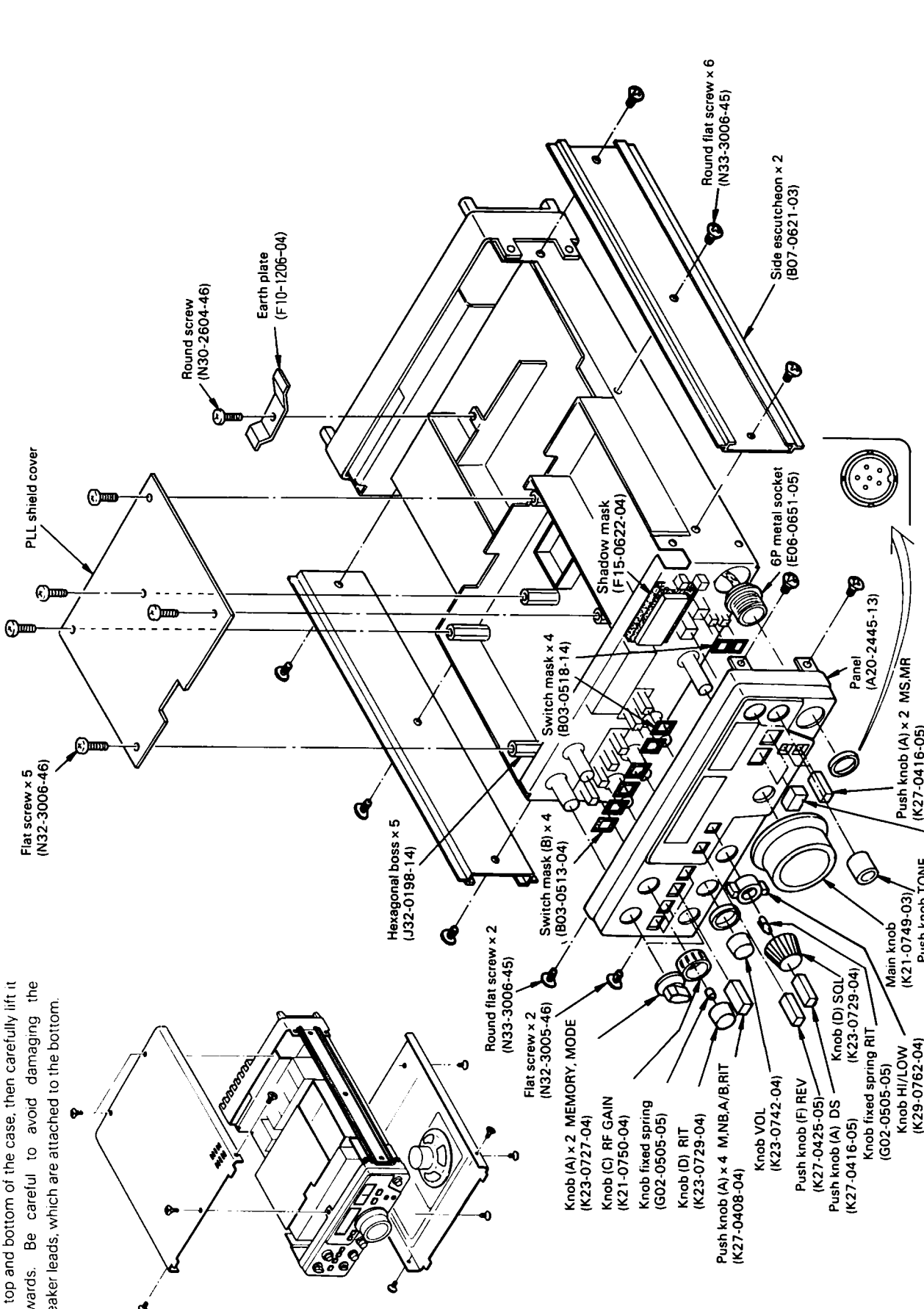

Round screw (N30-2604-46)
Earth plate (F10-1206-04)
Round flat screw × 6 (N33-3006-45)
Side escutcheon × 2 (B07-0621-03)
PLL shield cover
Shadow mask (F15-0622-04)
6P metal socket (E06-0651-05)
Flat screw × 5 (N32-3006-46)
Switch mask × 4 (B03-0518-14)
Panel (A20-2445-13)
Hexagonal boss × 5 (J32-0198-14)
Switch mask (B) × 4 (B03-0513-04)
Push knob (A) × 2 MS,MR (K27-0416-05)
Push knob (B) × 2 SCAN,HOLD (K27-0409-04)
Round flat screw × 2 (N33-3006-45)
Flat screw × 2 (N32-3005-46)
Main knob (K21-0749-03)
Push knob TONE (K27-0430-04)
Knob (A) × 2 MEMORY, MODE (K23-0727-04)
Knob (C) RF GAIN (K21-0750-04)
Knob fixed spring (G02-0505-05)
Knob (D) RIT (K23-0729-04)
Push knob (A) × 4 M,NB,A,B,RIT (K27-0408-04)
Knob VOL (K23-0742-04)
Push knob (F) REV (K27-0425-05)
Push knob (A) DS (K27-0416-05)
Knob (D) SQL (K23-0729-04)
Knob fixed spring RIT (G02-0505-05)
Knob HI/LOW (K29-0762-04)

Fig. 20

DISASSEMBLY

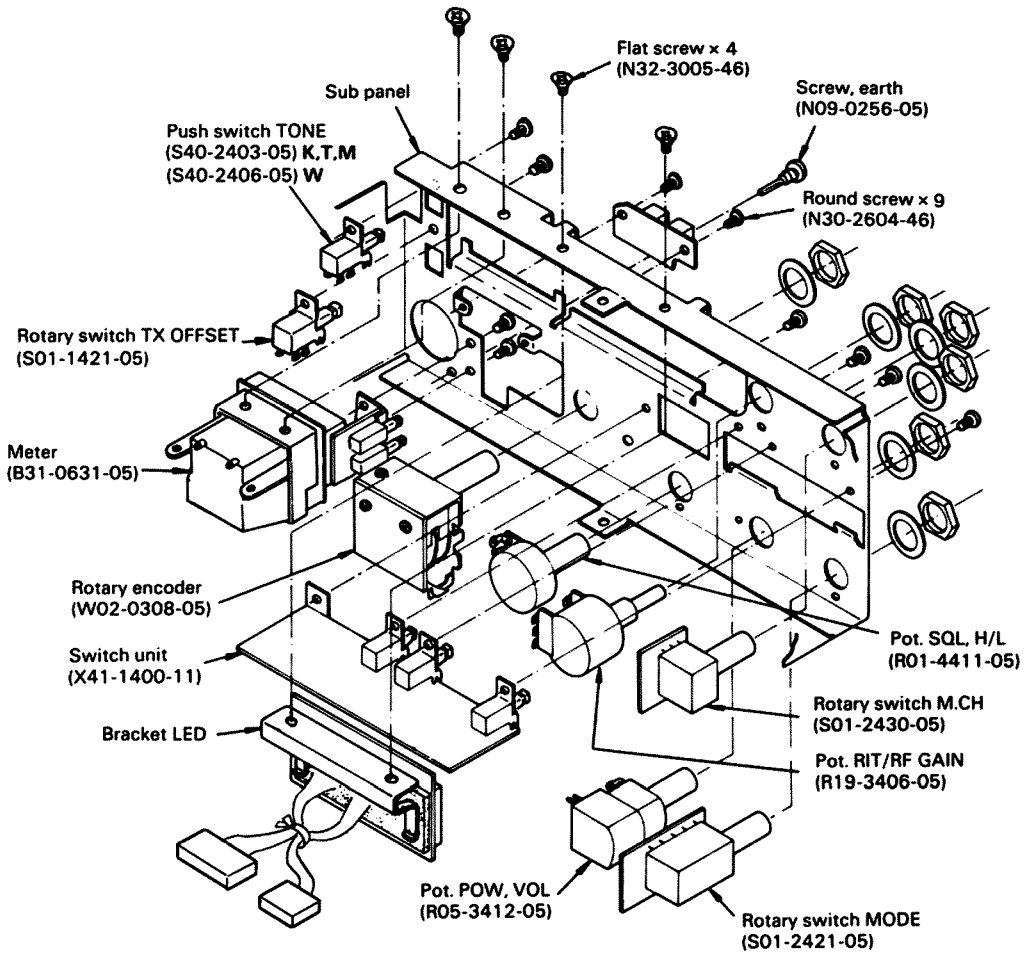


Fig. 21 Sub panel

* This number is that of the part into which the sockets and jacks are to be inserted. (Some parts are not supplied.)

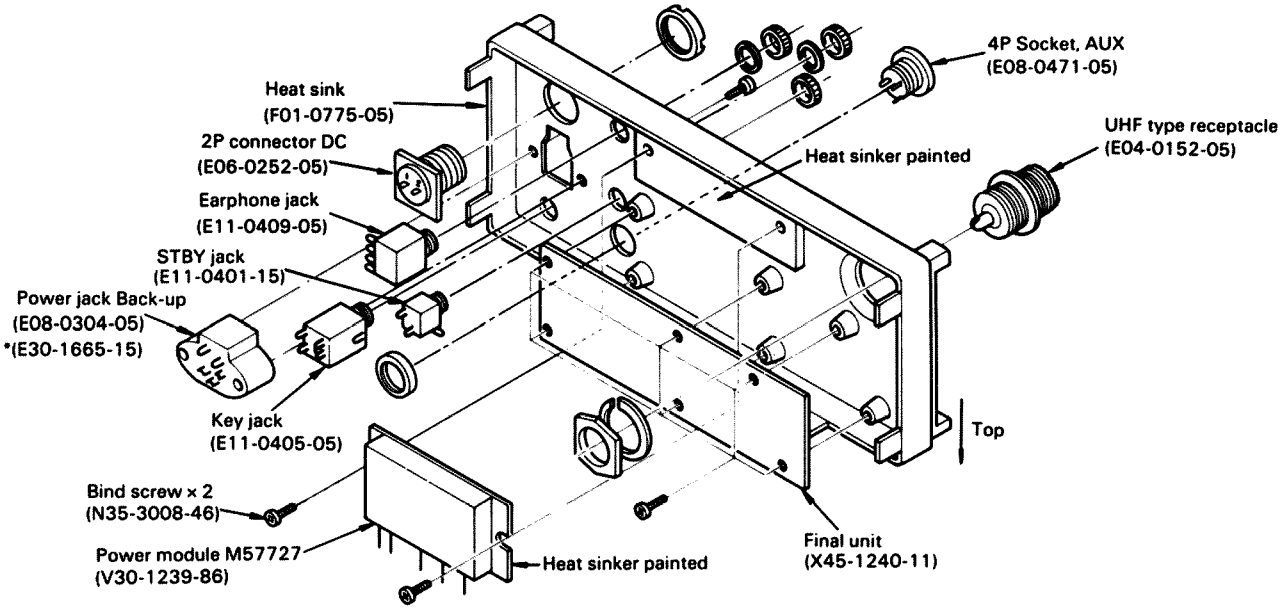
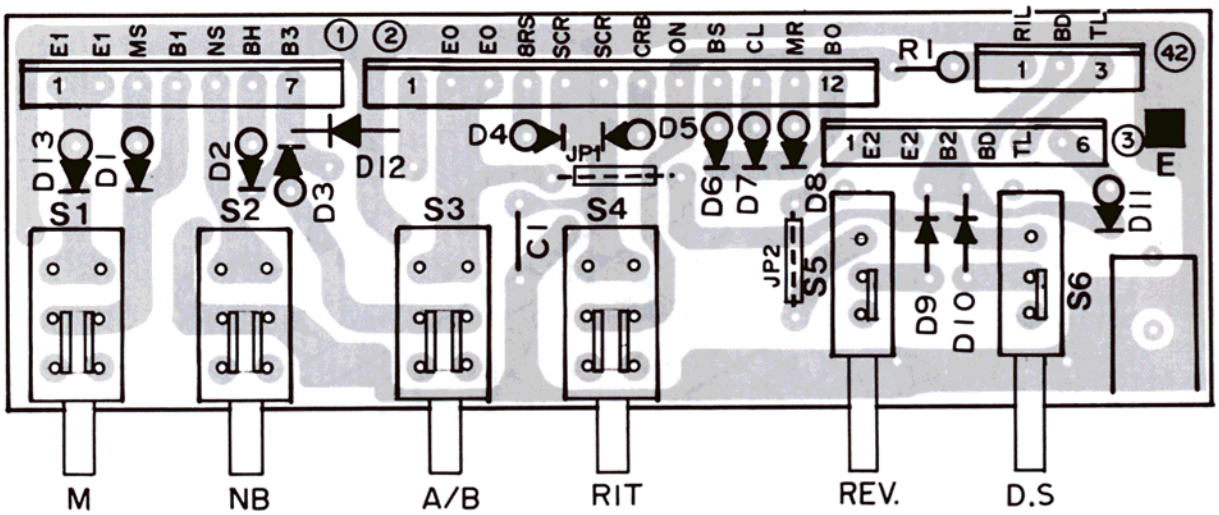


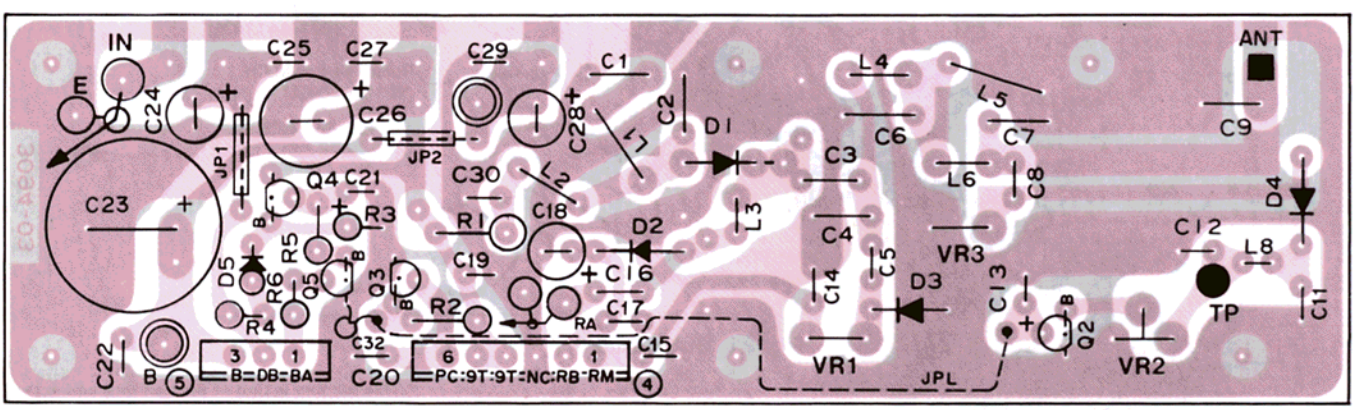
Fig. 22 Rear panel

PC BOARD VIEW

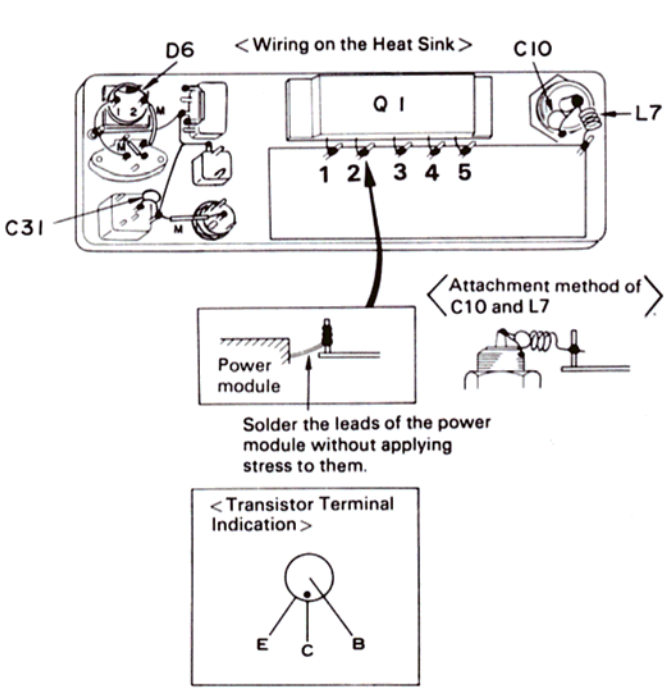
SWITCH UNIT (X41-1400-11) [Component Side View]

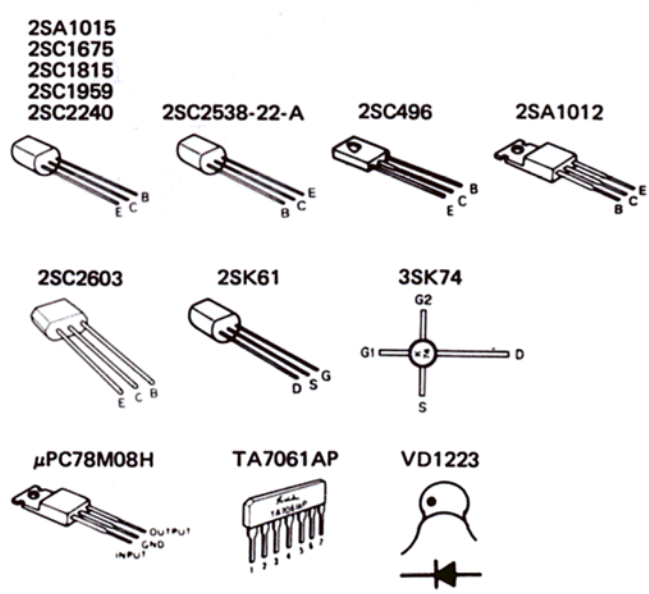

E1 E1 MS B1 NS BH B3
1 7
E0 E0 8RS SCR SCR CRB ON BS CL MR BO
1 12
RIL BD TL
1 3
42
R1
D13 D1 D2 D3 D12 D4 JP1 D5 D6 D7 D8 D9 D10 D11
1 E2 E2 B2 BD TL 6
3
E
S1 S2 S3 C1 S4 JP2 S5 S6
M NB A/B RIT REV. D.S

FINAL UNIT (X45-1240-11) [Component Side View]

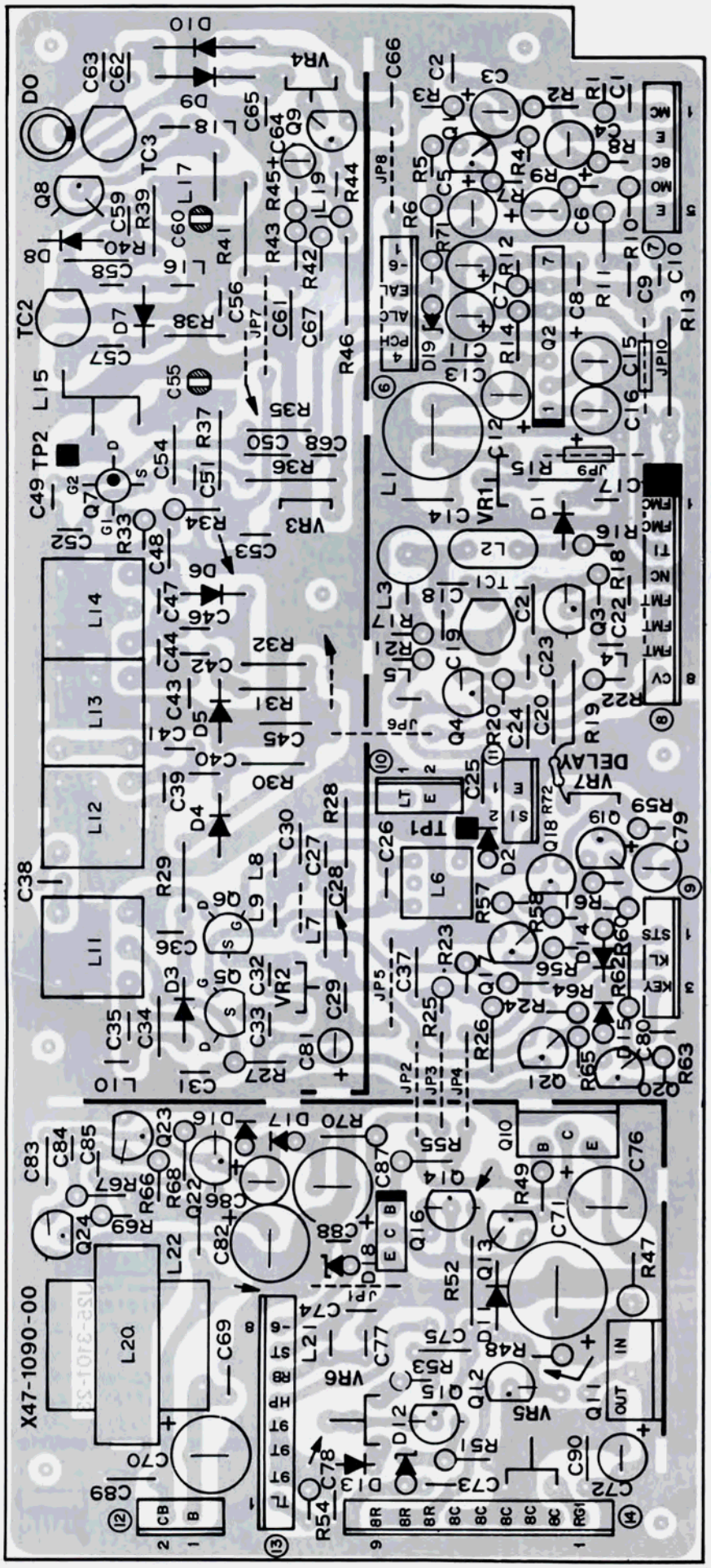


Q1 : M57727 Q2,3,5 : 2SC1815(Y) Q4 : 2SA1015(Y)
D1 : MI402 D2 : MI303 D3,4 : 1S1587 D5 : 1S1555 D6 : U15B



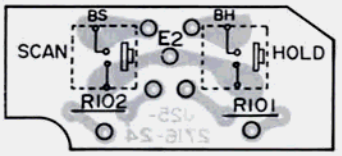


DRIVE UNIT (X47-1090-11,61) [Component Side View]

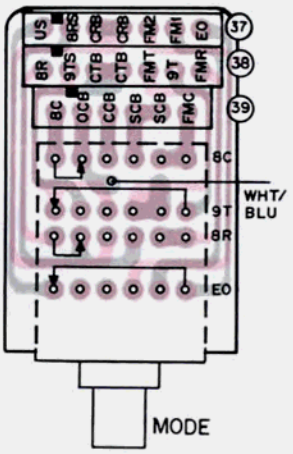


Q1 : 2SC2240(GR) Q2 : TA7061AP Q3,4 : 2SC1675(L) Q5,6 : 2SK61(GR) Q7 : 3SK74(L) Q8 : 2SC2538-22A Q9,17,18,23,24 : 2SC2603(D,E) Q10 : 2SA1012(Y)
Q11 : μPC78M08H Q12 : 2SC1959(Y) Q13 : 2SC1815(Y) Q15,19–22 : 2SA1015(Y) Q16 : 2SC496(Y)
D1 : 1S2208 D2 : 1S2588 D3–7 : ITT410 D8,11,14–17 : 1S1555 D9 : 1N60 D10 : 1S1587 D12, 18, 19 : XZ-060 D13 : VD1223

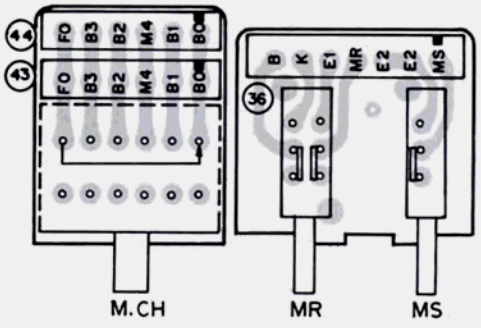
SCAN UNIT (J25-2716-24) [Component Side View]



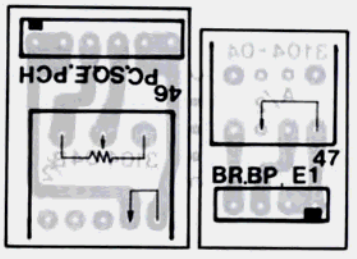
MODE UNIT (J25-3099-04) [Component Side View]



M.CH, MS UNIT (J25-3100-04) [Component Side View]



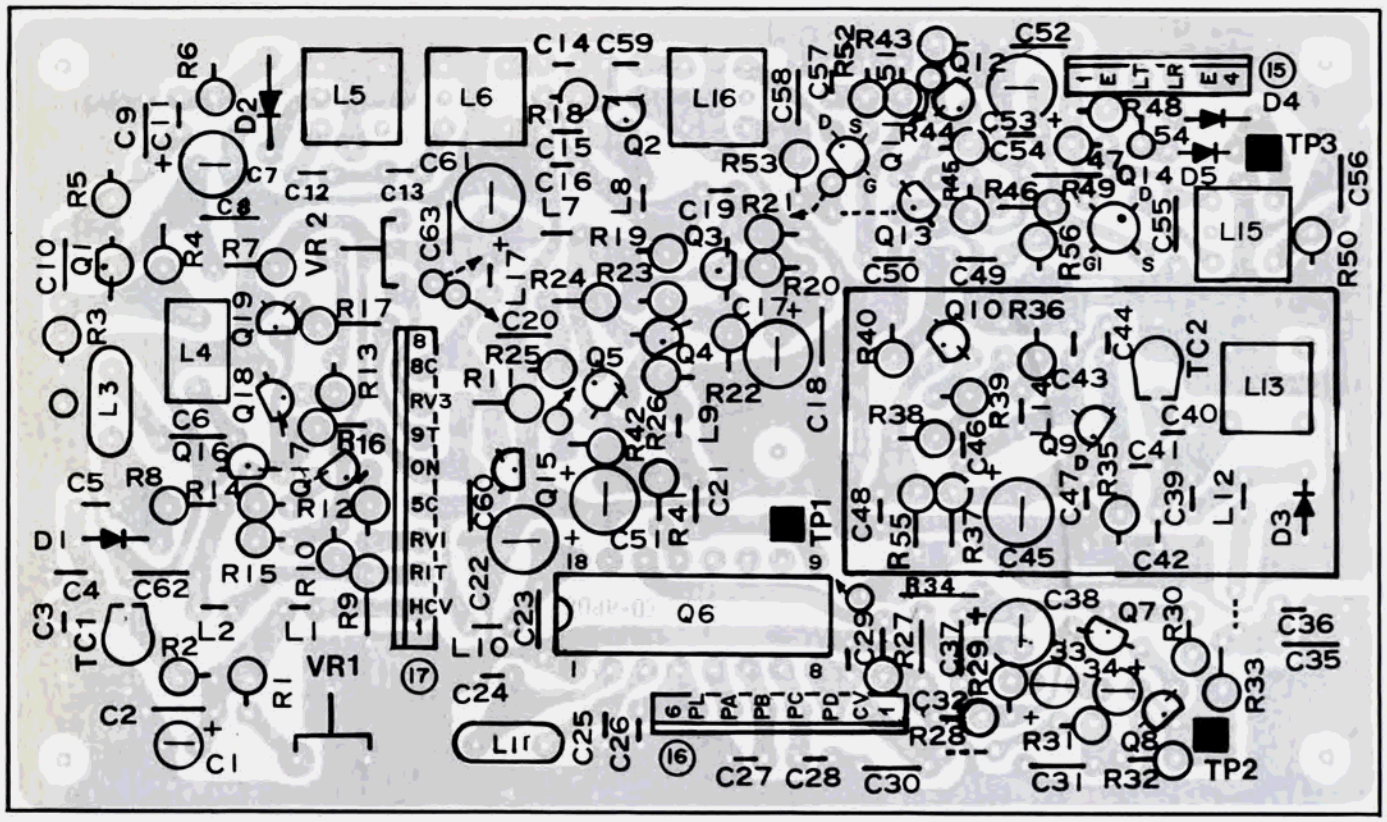
SQL, HI/LOW, TX OFFSET UNIT (J25-3104-04) [Component Side View]



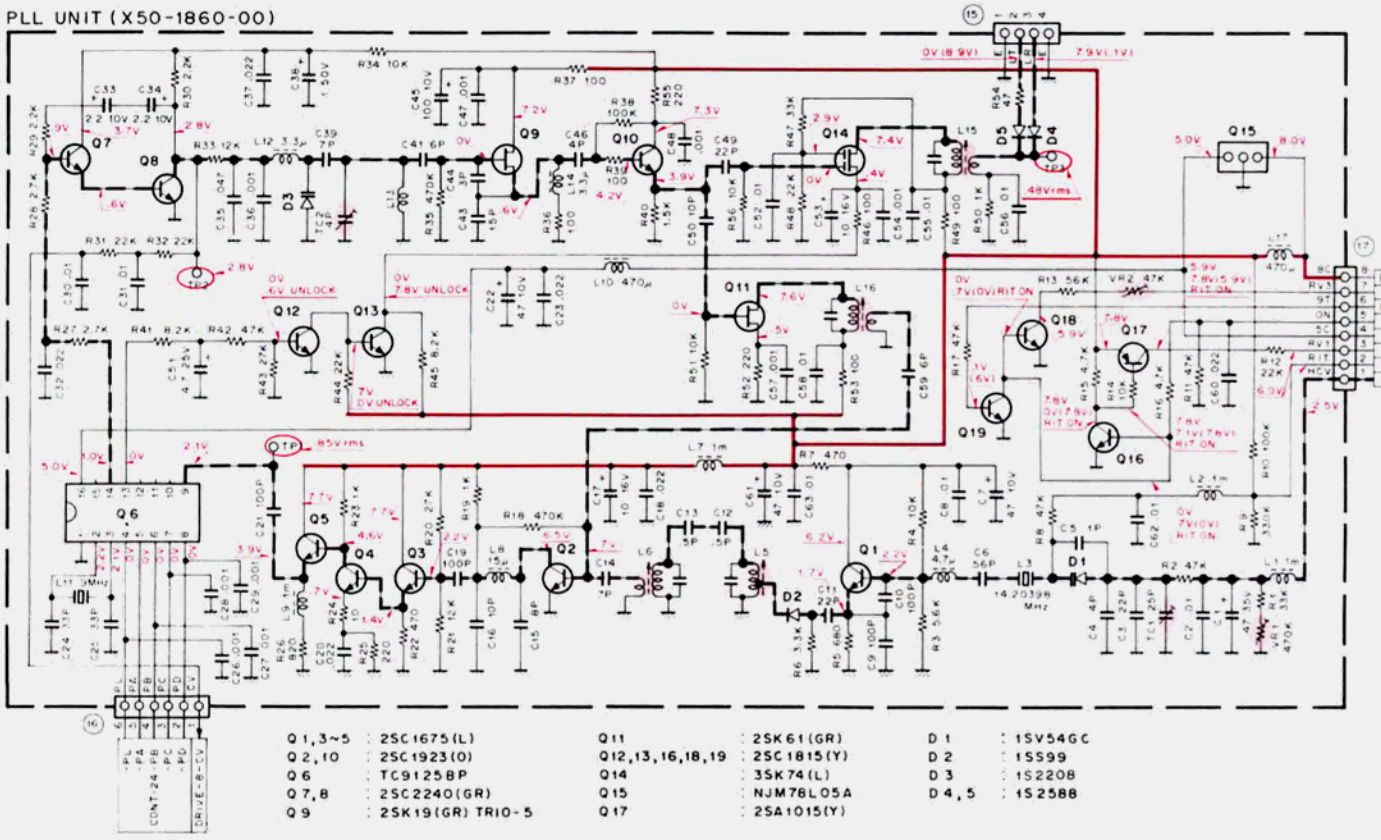
TR-9130

PC BOARD VIEW

PLL UNIT (X50-1860-00) [Component Side View]

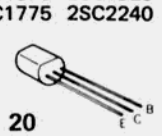


PLL UNIT (X50-1860-00)

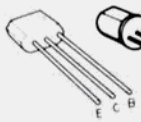


Q1,3~5	: 2SC1675(L)	Q11	: 2SK61(GR)	D1	: 1SV54GC
Q2,10	: 2SC1923(O)	Q12,13,16,18,19	: 2SC1815(Y)	D2	: 1SS99
Q6	: TC9125BP	Q14	: 3SK74(L)	D3	: 1S2208
Q7,8	: 2SC2240(GR)	Q15	: NJM78L05A	D4,5	: 1S2588
Q9	: 2SK19(GR) TRIO-5	Q17	: 2SA1015(Y)		

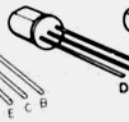
2SA1015 2SC1815
2SC1675 2SC1923
2SC1775 2SC2240



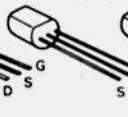
2SA1115
2SC2603



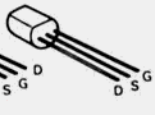
2SK19



2SK30A

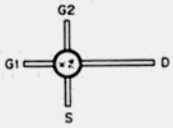


2SK61



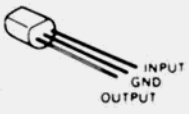
3SK73

3SK74



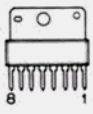
3SK76-O

NJM78L05A

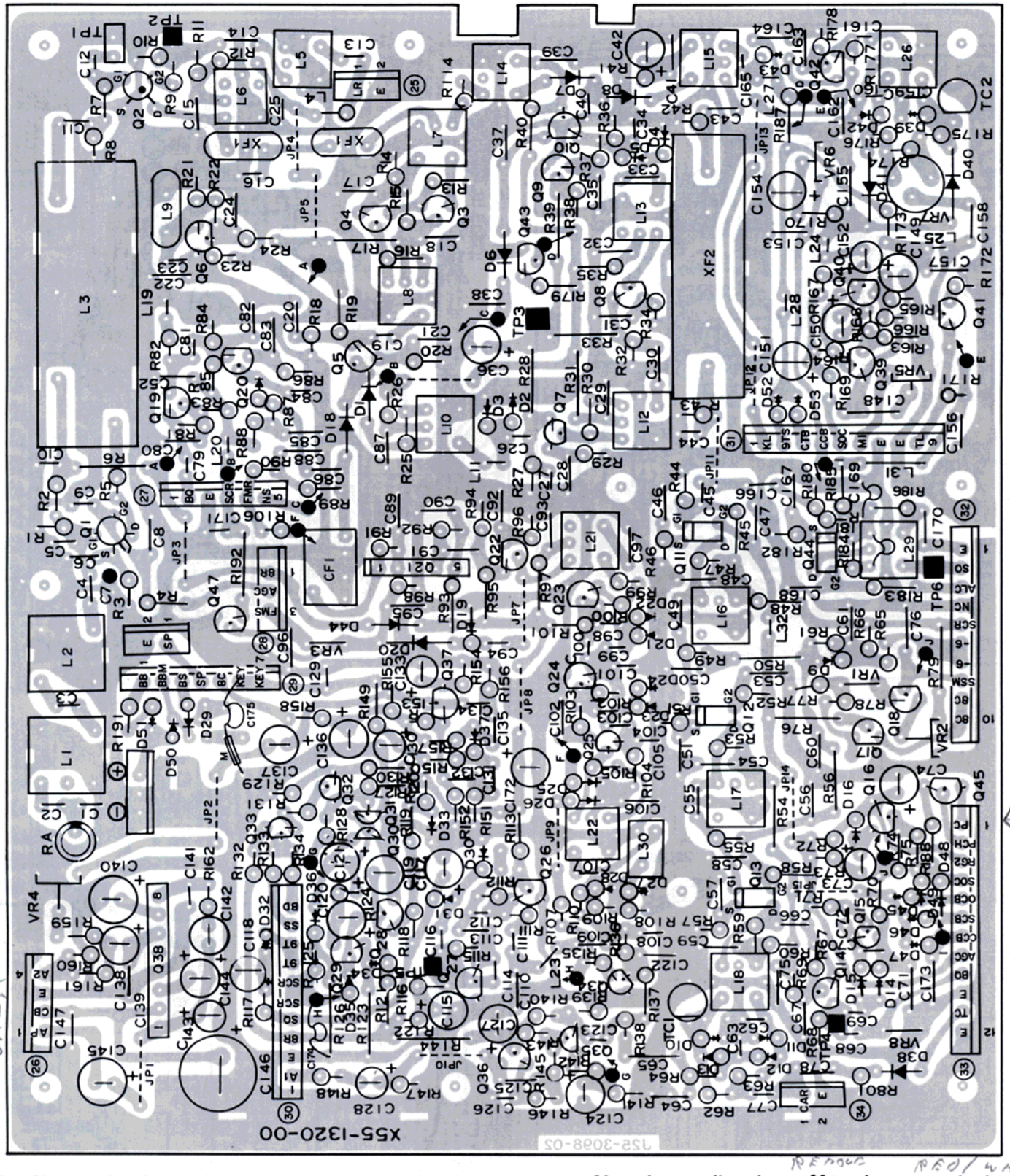


TA7060P

MB3713

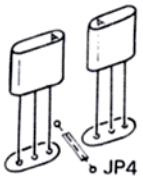


RX UNIT (X55-1320-00,11) [Component Side View]



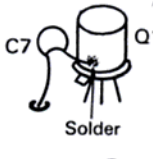
Q1 : 3SK76-O Q2 : 3SK74(L) Q3–8,19,20,22–25 : 2SC1675(L)
Q9,14,15,28–32,34,43,45,47 : 2SC2603(D,E) Q10,35,36,41 : 2SC1815(Y)
Q11–13,44 : 3SK73(GR) Q16 : 2SK30A(GR) Q17 : 2SK30A(O)
Q18 : 2SA1015(Y) Q21 : TA7060P Q26,27,37 : 2SC1775(E)
Q33 : 2SA1115(D) or (E) Q38 : MB3713 Q39,40 : 2SC2240(GR) Q42 : 2SK61(GR)
D1,6,9,16–18,21–26,29,32,34–37,44–53 : 1S1555
D2–5,10–15,19,20,27,28,30,31,39–42 : 1N60 D7,8,38,43 : 1S1587 D33 : 1S1212

[Attachment direction of XF1]



XF 1 should be used as a pair.

[Attachment method of Q1 and C7]



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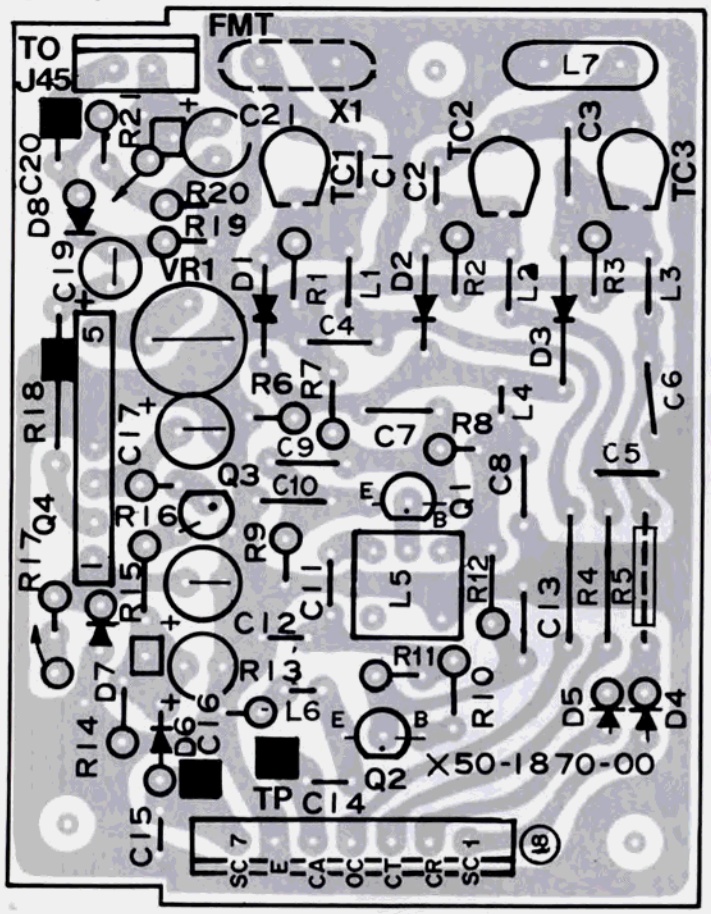
PC BOARD VIEWS

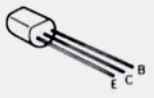
CAR UNIT (X50-1870-11,51,61)
[Component Side View]



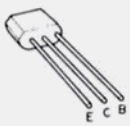
Q1,2 : 2SC1675(L)
Q3(W,T) : 2SC2603(D,E)
Q4(W,T) : AFG05F1750A2

D1–5,6(W,T), 8(W,T) : 1S1555
D7(W,T) : XZ-060

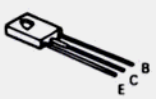
2SA1015
2SC1675
2SC1815
2SC1959



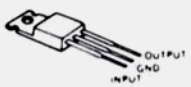
2SA1115



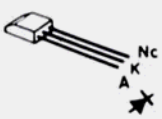
2SC496



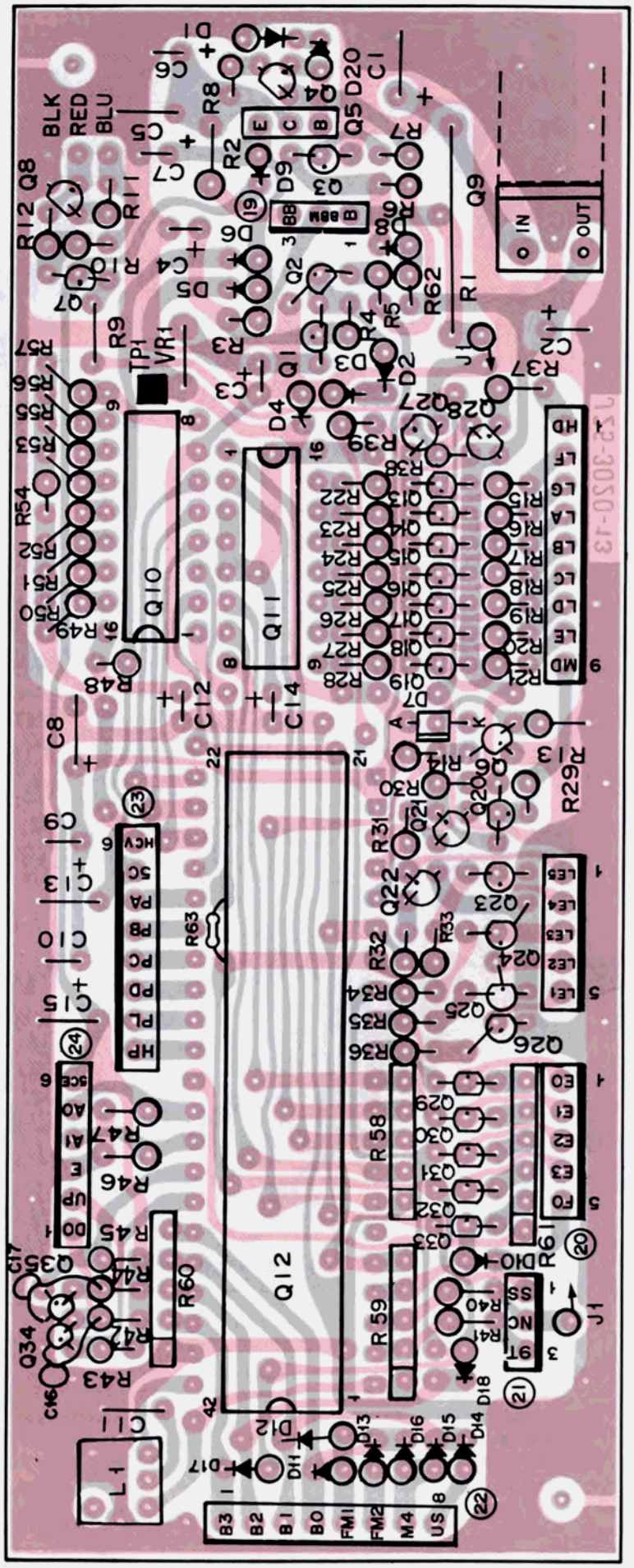
μPC78M05H



MA522



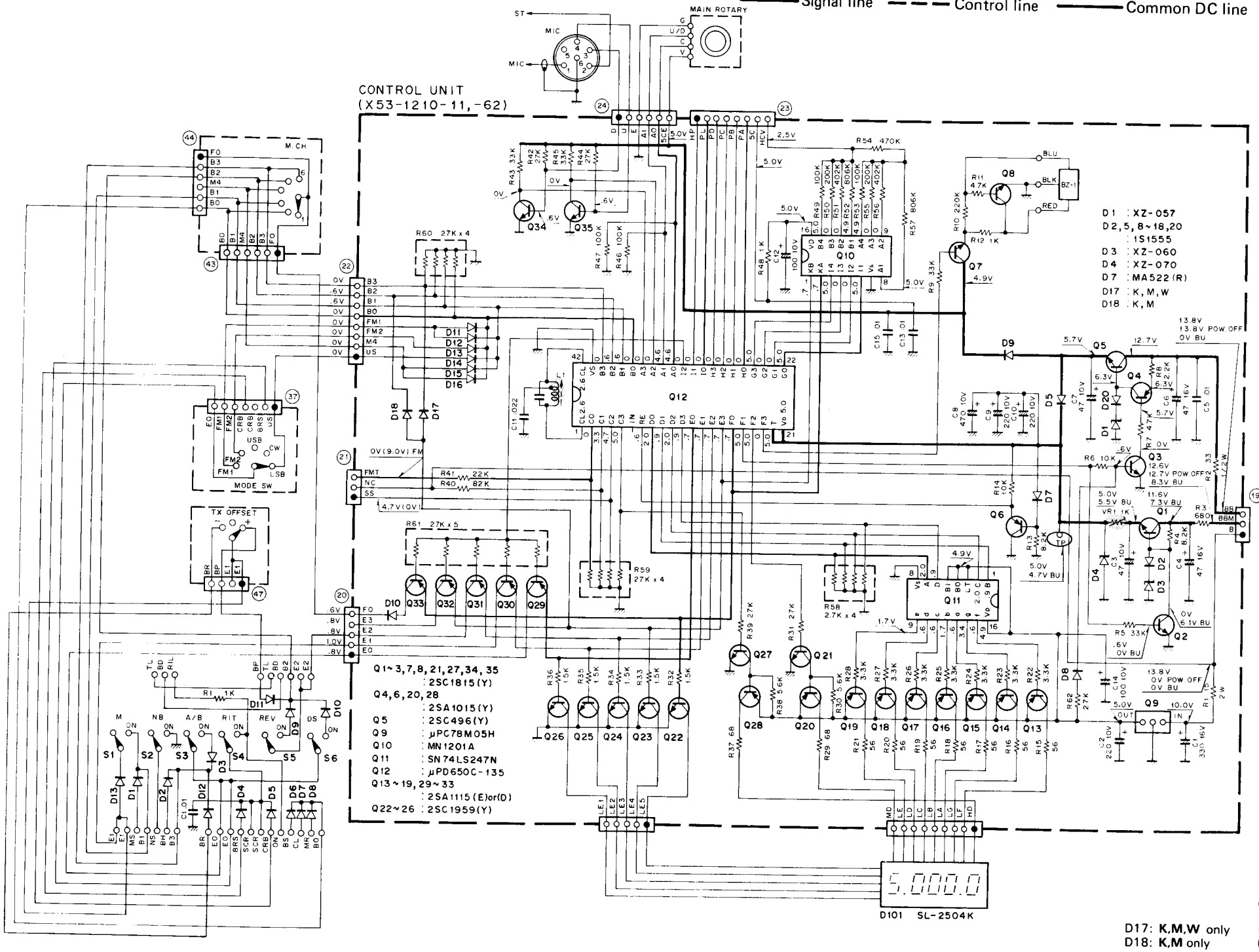
CONTROL UNIT (X53-1210-02) [Component Side View]



D17: K,M,W only
D18: K,M only

CONTROL UNIT (X53-1210-11,62)

Signal line — — — Control line ——— Common DC line



D17: K,M,W only
D18: K,M only

CIRCUIT DIAGRAM

ADJUSTMENTS

<Test Equipment>

1. DC V.M
   - High input impedance
2. RF VTVM (RF V.M.)
   - Input impedance: 1 MΩ and less than 2 pF
   - Voltage range: F.S. = 10 mV to 300V
   - Frequency range: 150 MHz or greater
3. Frequency counter (F count)
   - Minimum input voltage: 50 mV
   - Frequency range: 150 MHz or greater
4. DC power supply
   - Voltage 10V to 17V variable
   - Current: 6A min.
5. RF Dummy Load
   - Dissipation: 20W
   - Impedance: 50Ω
   - Frequency range: 144 MHz
6. AF VTVM (AF V.M.)
   - Input impedance: 1 MΩ or greater
   - Voltage range: F.S = 1 mV to 30V
   - Frequency range: 50 Hz to 10 kHz
7. AF Generator (AG)
   - Frequency range: 100 Hz to 10 kHz
   - Output: 0.5 mV to 1V
8. Linear detector
   - Frequency range: 144 MHz
9. Field strength tester
   - Frequency range: 144 MHz
10. Directional coupler
11. Oscilloscope
    - With horizontal input and high sensitivity
12. Standard signal generator (SSG)
    - Frequency range: 144 ~ 149 MHz
    - Modulation: amplitude and frequency modulation
    - Output: −20 dB ~ 100 dB
13. AF Dummy load
    - 8Ω, 5W (approx.)
14. Noise generator
    - Must generate ignition-like noise containing harmonics beyond 144 MHz
15. Sweep generator
    - Frequency range: 144 ~ 149 MHz

<Preparation>

Unless otherwise specified, set the controls as follows

POWER/VOL SW	ON
SEND/REC	REC
RF GAIN VOL	MAX (Full Clockwise)
SQUELCH VOL	MIN
MODE SW	USB
VFO A/B SW	A
REV	OFF
HI/LOW SW	HI
RIT VOL	Centered
RIT SW	OFF
NB SW	OFF
SCAN SW	OFF (HOLD ON)
MR	OFF
MS	OFF
DS	OFF

Notes:

- When adjusting the trimmers or coils, use a non-induced adjusting rod of bakelite, etc.
- When adjusting the RX section never transmit to prevent SSG damage.
- Connect MIC connector as shown in Fig. 23.
- **The output level of SSG is indicated as SSG's open circuit.**

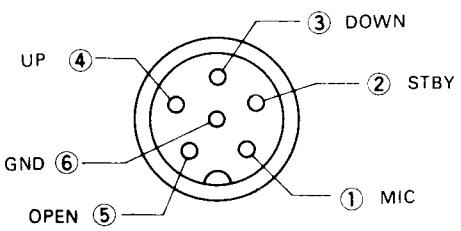


Fig. 23 MIC terminals (view from front panel side)

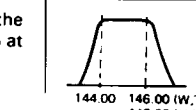
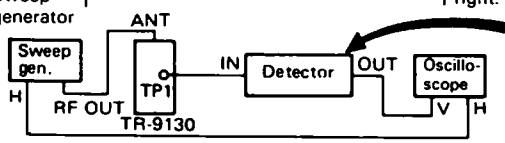
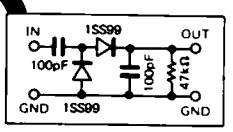
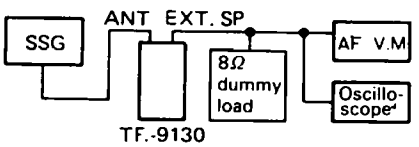
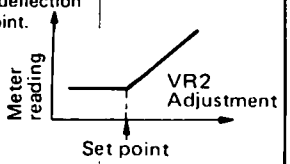
ADJUSTMENTS

<TR-9130>

Item	Condition	Measurement			Adjustment			Specifications
		Test equipment	Unit	Ter-minal	Unit	Parts	Method	
1. Voltage check in RX mode	1) 8C	DC V.M	DRIVE	⑭ 8C			Check	7.7 ~ 8.3V
	2) 8R			⑭ 8R				7.7 ~ 8.3V
	3) 9T			⑬ 9T				Less than 0.1V
	4) -6			⑬ -6				-5.8 ~ -6.2V
	5) 5C		PLL	⑰ 5C				4.8 ~ 5.2V
2. Voltage check in TX mode	1) TX mode -6	DC V.M	DRIVE	⑬ -6			Check	-5.8 ~ -6.2V
	2) 8R			⑭ 8R				Less than 0.5V
	3) 9T			⑬ 9T	DRIVE	VR6	9.0V	+0.1V, -0V
3. Back up voltage check	1) RX mode Power SW: OFF		CONTROL	TP	CONTROL	VR1	5.0V	4.9 ~ 5.1V
	2) Power SW: ON							
4. PLL	1) MODE SW: FM1 A/B SW: B f: 144.00 (W.T), 148.00 (K.M)	DC V.M	PLL	TP2	PLL	TC2	2.0V (W.T) 6.0V (K.M)	±0.5V
	2) f: 145.98 (W.T.), 148.00 (K.M)	RF V.M		TP1		L5, 6, 16	MAX (Repeat)	More than 0.6V
	3) A/B SW: A f: 145.00 (W.T), 148.00 (K.M) TX mode			TP3		L15	MAX	More than 0.4V
	4) RX mode							
5. PLL frequency	1) MODE SW: USB f: 144.9999	f counter	PLL	TP3	PLL	TC1	134.3064 MHz	±30 Hz
	2) f: 145.0000					VR1	134.3065 MHz	±30 Hz
	3) RIT control: centered RIT SW: ON					VR2	134.3065 MHz	±30 Hz
	4) RIT control: CW							134.3073 MHz or greater
	5) RIT control: CCW							134.3057 MHz or less
	6) TX mode							134.3065 MHz
	7) RX mode RIT control: centered RIT SW: OFF							
6. CAR	1) MODE SW: USB	RF V.M	CAR	TP	CAR	L5	Adjust 0.3V with adjust the core CCW. from the peak	
	2)	f counter				TC3	10.6935 MHz	±50 Hz
	3) MODE SW: CW TX mode					TC2	10.6943 MHz	±50 Hz
	4) RX mode						Check	10.6935 MHz
	5) MODE SW: LSB					TC1	10.6965 MHz	±50 Hz

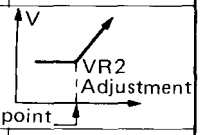
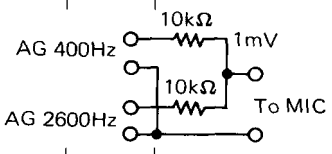
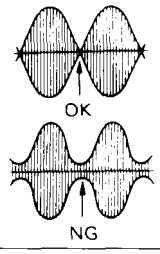
ADJUSTMENTS

<RX SECTION>

Item	Condition	Measurement			Adjustment			Specifications
		Test equipment	Unit	Terminal	Unit	Parts	Method	
1. RG1 voltage	1) RG1 voltage	DC V.M	DRIVE	RG1	DRIVE	VR5	4.0V	±0.1V
2. Helical	1) Connect the sweep generator output to the ANT terminal.	Oscilloscope, Sweep generator	RX	TP1	RX	L1, 2, 3	Adjust to obtain the waveform shown at right.   	
3. Sensitivity adjustment	1) Connect an AF VTVM, oscilloscope, and an 8Ω load to the EXT SP terminal. Connect an SSG to the ANT terminal on the rear panel.	SSG, Oscilloscope, AF V.M, 8Ω dummy load						
	2) f: 145.100 (W.T), 146.100 (K.M) SSG: −10 dBμ MODE SW: CW Turn L7 (RX unit) full CCW, then turn 1-1/2 CW.	AF V.M Oscilloscope		EXT. SP	RX	L5, 7 14 ~ 18	MAX (First L14, then L7)	(3.5V) Note: ( ) Reference Value
	3) RF GAIN control: MIN (full CCW)	RF V.M	RX	TP4	RX	TC1	MIN	(0.003V)
	4) RF GAIN control: MAX MODE SW: FM1 SSG output: 10 dBμ (MOD: 1 kHz, DEV.: 5 kHz)	AF V.M				L7, 22	MAX	(5.0V)
		S-Meter				L6, 8	MAX	
	5) SSG output: 100 dBμ	AF V.M Oscilloscope					Check	Should be normal output is obtained.
	6) SSG output: −7 dBμ (W.T) −6 dBμ (K.M)			EXT SP			S/N	More than 20 dB
4. FM S-Meter	1) SSG output: 30 dBμ	S-Meter			RX	VR3	Adjust VR3 for a meter reading of "10" on a scale of 1 – 10.	
5. SSB. CW S-Meter	1) MODE SW: USB SSG output: OFF Adjust L17 CCW, until S-Meter not deflects. (This adjustment is needed when S-Meter deflects by noise.)	S-Meter			RX	VR2	Set to the deflection starting point. 	
	2) SSG output: 0 dBμ Adjust the frequency for maximum S-Meter reading.	S-Meter			RX	L17	Turn the core CCW, until the meter reads "1" on a scale of 1 – 9.	
	3) SSG output: 20 dBμ					VR1	The meter reads "9" on a scale of 1 – 9.	
6. NB	1) SSG output: 15 dBμ	DC V.M	RX	TP3	RX	L10, 12	MIN (Repeat)	(2.6V)
	2) Pulse noise							Pulse noise should be reduced.
7. SSB sensitivity	1) SSG output: −8 dB (W.T) −6 dB (K.M)	AF V.M Oscilloscope	EXT. SP				Check	S/N more than 10 dB
8. SSB squelch	1) MODE SW: FM2 f: 145.10 (W.T), 146.10 (K,M) SSG output: OFF	BUSY LED			Front panel	SQ control	Turn the SQ control CW, until the LED goes off.	
	2) MODE SW: USB SSG output: −13 dBμ				RX	VR8	LED goes off	

ADJUSTMENTS

<TX SECTION>

Item	Condition	Measurement			Adjustment			Specifications
		Test equipment	Unit	Terminal	Unit	Parts	Method	
1. FM CAR	1) Disconnect the LT ⑩ connector on the DRIVE unit. MODE SW: FM1 TX mode	RF V.M	DRIVE	TP1	DRIVE	L6	MAX	(0.2V)
	2)	f counter				TC1	10.6950 MHz	±100 Hz
2. Drive	1) Disconnect the LT ⑩ connector on the DRIVE unit. f: 145.00 (W.T), 146.00 (K.M) DRIVE unit (VR4: full CCW, TC3: MAX)	RF V.M	DRIVE	TP2	DRIVE	L6, 11 ~ 14 TC2	MAX (Repeat)	(3V)
	2) Connect power meter to DO terminal.	Power meter (0.6W)		DO		TC2, 3	MAX	(0.25W)
3. Power	1) Reconnect DO terminal coaxial cable.	Power meter (30W)		ANT	DRIVE	TC3	MAX	Greater than 17W
	2) f: 144.00 or 145.98 (W.T) 148.00 (K.M)						Check	Greater than 17W
	3) f: 145.00 (W.T), 146.00 (K.M)					VR4	28W	
		DC A.M					Check	Less than 6.2A
	4) f: 145.98 (W.T), 147.00 (K.M)	Spectrum analyzer				VR2	Min. ±10.7 MHz spurious	Less than −60 dB
4. RF meter LOW power	1) HI/LOW SW: HI	Meter			FINAL	VR1	The meter reads "8" on a scale of 1 ~ 10.	
	2) HI/LOW SW: LOW	Power meter		ANT	DRIVE	VR3	5W	
	3) f: 144.00 or 145.98 (W.T) 148.00 (K.M)						Check	0.5 ~ 2.0W
5. Protection	1) f: 145.00 (W.T), 148.00 (K.M) HI/LOW SW: HI	DC V.M	FINAL	TP	FINAL	VR3	MIN	(30mV)
	2) ANT terminal on rear panel: open		DRIVE	⑥PCH		VR2	Adjust the VR2 CW, set the voltage the point where the voltage is increased rapidly. 	
		DC A.M						Less than 2.3A (total current)
	3) Connect power meter							
6. FM deviation	1) Mic terminal: AG (1 kHz, 15 mV)	Linear detector			DRIVE	VR1	5 kHz	
	2) AG output: 1 kHz, 4mV						Deviation check	Greater than 3.5 kHz
7. CW CAR level	1) Disconnect the ⑩ LT connector on the DRIVE unit. f: 144.50 MODE SW: CW	RF V.M	RX	TP6	RX	L26, 29	MAX	
						VR6	0.2V	
	2) Reconnect the ⑩ LT connector on the DRIVE unit.							
8. CAR point	1) MODE SW: USB MIC terminal: two-tone signal (400 Hz + 2600 Hz)	Oscilloscope Power meter			CAR	TC3	Adjust to obtain the waveform shown.  	
	2) MODE SW: LSB					TC1	Adjust as in 8-1)	

ADJUSTMENTS

Item	Condition	Measurement			Adjustment			Specifications
		Test equipment	Unit	Terminal	Unit	Parts	Method	
9. CAR suppression	1) MIC terminal: open MODE SW: USB or LSB	Oscilloscope or Spectrum analyzer Power meter			RX	TC2 VR7	MIN	More than −50 dB
10. SSB MIC gain	1) MODE SW: USB MIC terminal: AG (1.5 kHz, 1.5 mV)	Power meter		ANT	RX	VR5	5W	
	2) MIC terminal : AG (1.5 kHz, 15 mV)						Check	More than 25W
11. Side tone	1) MODE SW: CW AF control: centered Connect a key to the KEY terminal on the rear panel Key down.	AF V.M Power meter		EXT. SP	RX	VR4	0.5V	
	2) Confirm CW DELAY				DRIVE	VR7	Turn TR7 CW. Turn VR7 CCW	DELAY time should become longer. DELAY time should become storter.
	3) DELAY					VR7	Center	
12. Tone W, T type only	1) W-Type ONLY MODE SW: FM1 TONE SW: ON	f counter Linear detector	CAR	TO	CAR	VR1	1750 Hz Check	Greater than 2.5 kHz
	2) T-TYPE ONLY MODE SW: FM1 Connect TP5 and TPL TONE SW: ON TX mode	f counter Linear detector	CAR	TO	CAR	VR1	1750 Hz Check	Greater than 2.5 kHz

< Micro-processor operational check >

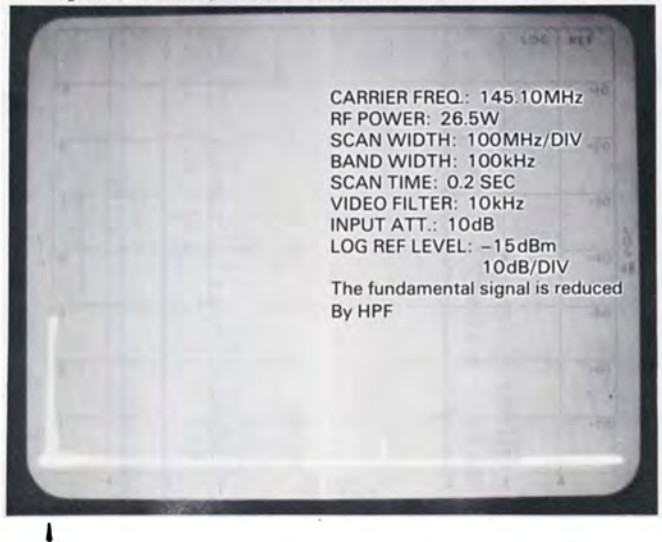
Item	Condition	Specification
1. Reset check	1) Disconnect DC power. Reconnect after waiting 20 sec. Disconnect the BACK-UP battery if a battery is installed.	Display 5.000.0
	2) VFO A/B SW: B	Display 4.000.0
	3) VFO A/B SW: A MR SW: ON MEMORY SW: 1	Display 5.000.0
	4) MEMORY SW: 2 ~ 6	Display 4.000.0
	5) MR SW: OFF	
2. Dial step and number of digits displayed	1) MODE SW: USB, CW, LSB Turn the VFO dial clockwise one click at a time until the display becomes 5.001.0, then turn it counterclockwise until 4.999.0 is displayed.	The display should vary in 100 Hz steps. (5 digits display)
	2) DS SW: ON Turn the VFO dial.	The display should vary in 5 kHz steps. (5 digits display)
	3) MODE SW: FM2 Turn the VFO dial.	The display should vary in 1 kHz steps. (4 digits display)
	4) DS SW: OFF Turn the VFO dial.	The display should vary in 5 kHz (K.M), 12.5 kHz (W.T) steps.

Item	Condition	Specification
	5) MODE SW: FM1 Turn the VFO dial.	The display should vary in 10 kHz (K.M), 25 kHz (W.T) steps.
	6) DS SW: ON	The display should vary in 5 kHz (K.M), 25 kHz (W.T) steps.
3. Memory write	1) MODE SW: FM2 MEMORY SW: 1 f: 145.001 M SW: ON	The tone should be heard when the M SW is pressed.
	2) MEMORY SW: 2 f: 145.002 M SW: ON	
	3) MEMORY SW: 3 f: 145.003 M SW: ON	
	4) MEMORY SW: 4 f: 145.004 M SW: ON	
	5) MEMORY SW: 5 f: 145.005 M SW: ON	
	6) MEMORY SW: 6 f: 145.006 M SW: ON	Pulsed tone sounds when the M SW is pressed.
	7) MEMORY SW: 6 f: 145.007 M SW: ON	Stop pulsed tone when the M SW is pressed.

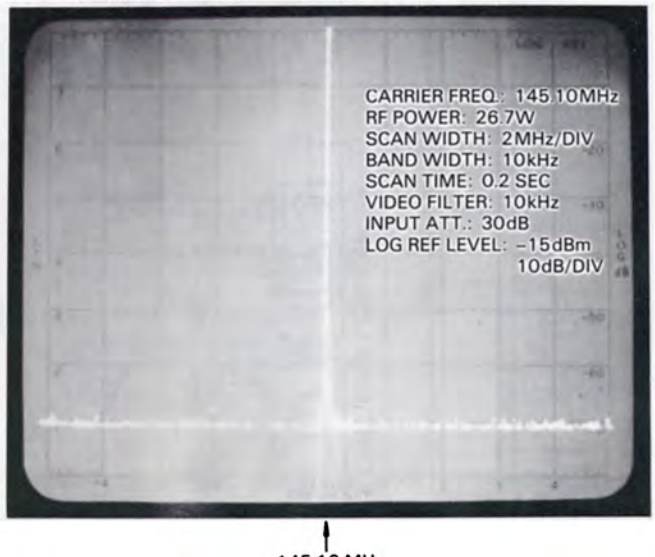
ADJUSTMENTS

Item	Condition	Specification
4. Memory call	1) MR SW: ON	Display 145.006
	2) Transmit	Display 145.007
	3) Receive	Display 145.006
	4) MEMORY SW: 5	Display 145.005
	↓ 4	Display 145.004
	↓ 3	Display 145.003
	↓ 2	Display 145.002
	↓ 1	Display 145.001
	5) MR SW: OFF	Display 145.007
5. MS	1) SQ control: MAX (full CW) MS SW: ON	Display scans repeatedly from 5.001 ~ 5.006 by 1 CH steps. The MHz decimal flashes.
	2) SQ control: MIN (full CCW)	Memory scan stops. The MHz decimal flashes. The BUSY indicator lights.
	3) SCAN SW: ON	The next memory chancel is displayed when the scan SW is depressed.
	4) SQ control: Turn until BUSY LED goes off.	Scan starts.
	5) HOLD SW: ON	Scan stops. The MHz decimal flashes.
	6) SCAN SW: ON	Scan starts.
	7) Transmit	Scan stops. The MHz decimal stops flashing.
	8) Receive	Scan stops. The MHz decimal flashes.
	9) MS SW: OFF	Display 5.007
6. SCAN	1) SQ control: MAX (full CW) SCAN SW: ON	Display should vary in 1 kHz steps, and scan within 1 MHz. (0.000 ~ 0.999)
	2) SQ control: MIN (full CCW)	Scan stops. The MHz decimal flashes.
	3) SQ control: Turn until BUSY LED goes off.	Scan resumes.
	4) HOLD SW: ON	Scan stops.
	5) SCAN SW: ON	Scan resumes. The MHz decimal flashes.
	6) Transmit	Scan stops. The MHz decimal remains on.
	7) Receive	Scan stops. The MHz decimal remains on.
7. SHIFT	1) MODE SW: FM1 TX OFFSET: + f: 147.40 (K.M), 145.40 (W,T) Transmit	The tone sounds.
	2) f: 147.39 (K.M), 145.39 (W,T) Transmit	Display 147.99 (K.M), 145.99 (W.T)
	3) f: 144.59 TX OFFSET: – Transmit	The tone sounds.
	4) f: 144.60 Transmit	Display 144.00
	5) REV SW: ON	Display 144.00
	6) Transmit	Display 144.60
	7) REV SW: OFF TX OFFSET: S	
8. UP/DOWN (Micro-phone)	1) MODE SW: USB Connect MIC to the MIC terminal. Momentarily press the MIC up siwtch.	The tone sounds. Display frequency increases by 100 Hz at each key press.
	2) Press the UP switch continuously.	The display frequency increases continuously, and tone is continuous.
	3) Press the DOWN switch.	The tone sounds. Display frequency decreases by 100 Hz at each key press.
	4) Press the DOWN switch continuously.	The display frequency decreases continuously, and tone is continuous.

[Harmonic spurious response characteristic]

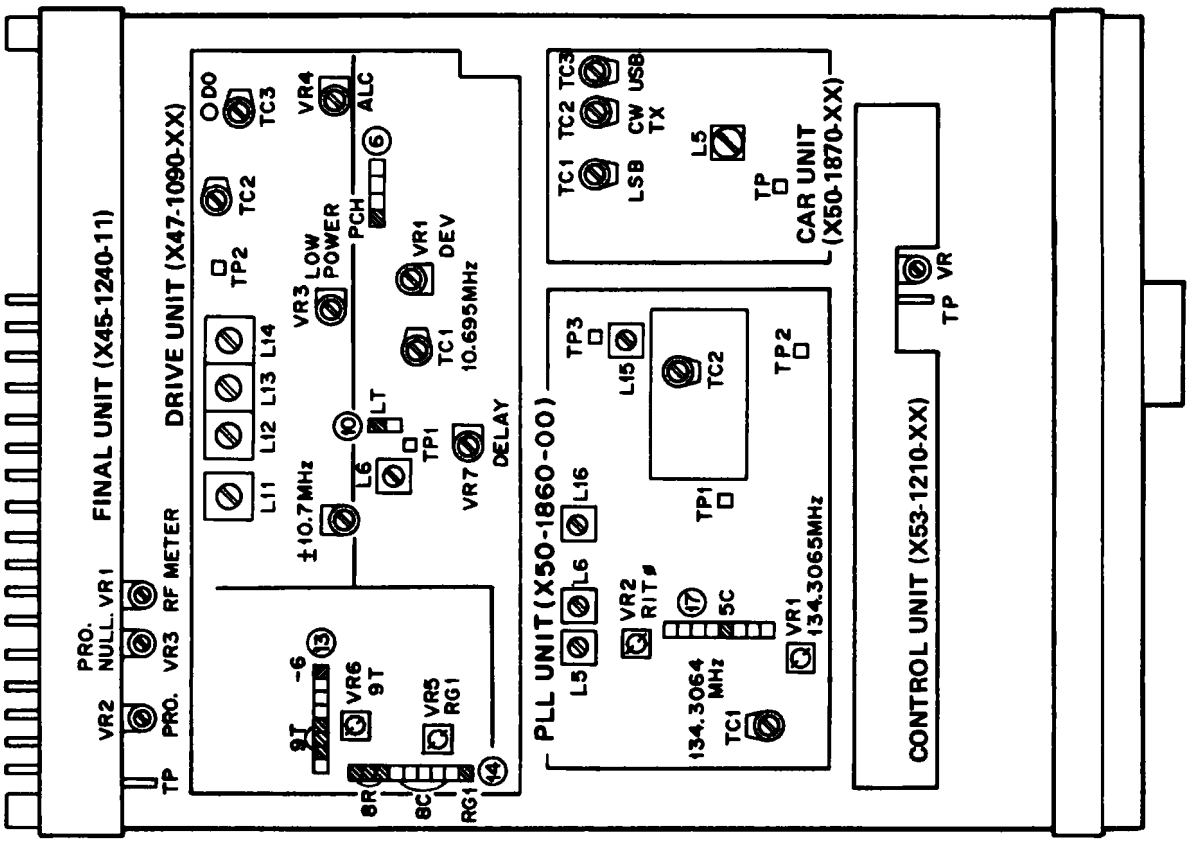


[Adjacent spurious response characteristic]

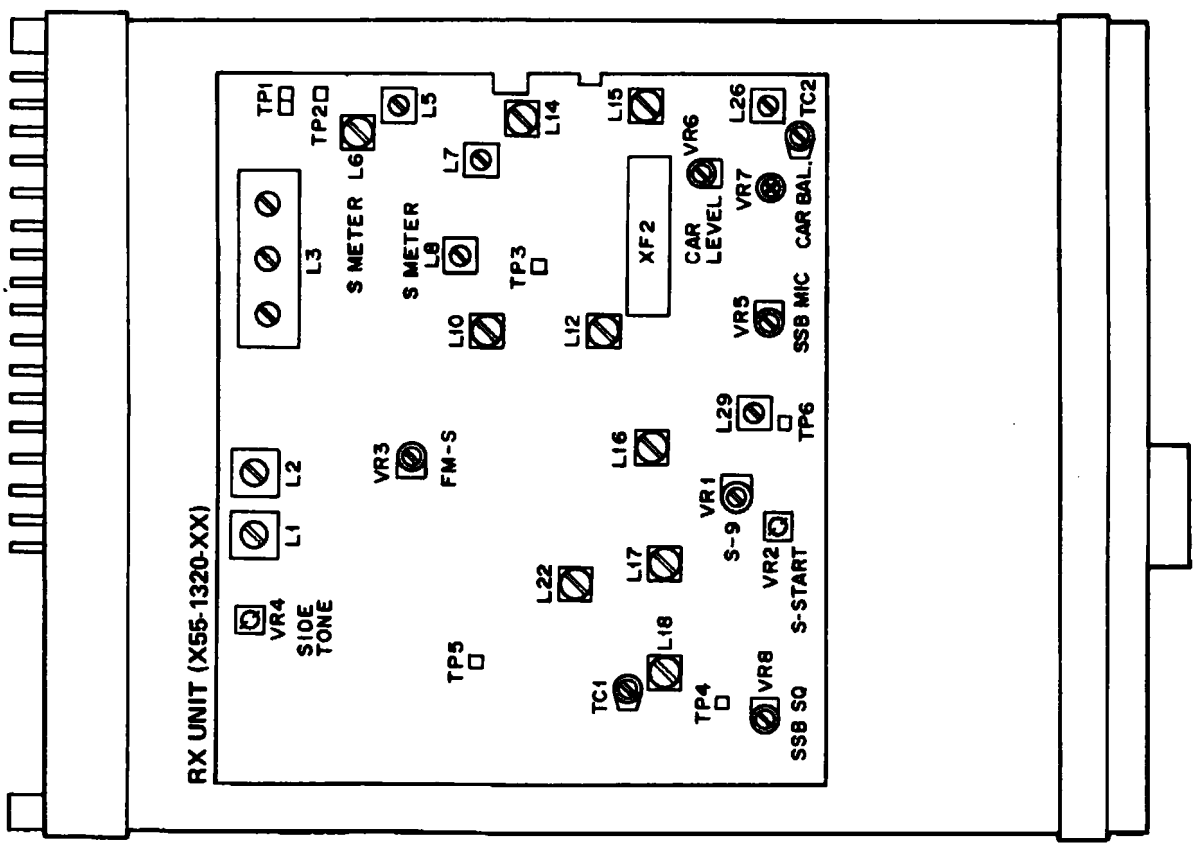


ADJUSTMENTS

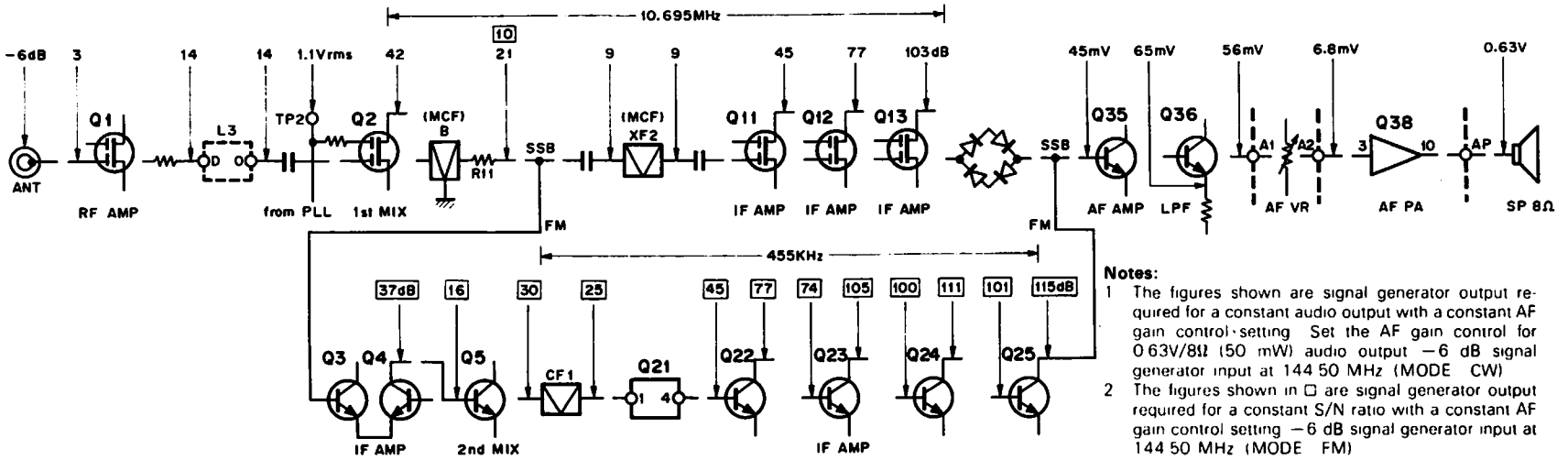
[Top View]



[Bottom View]



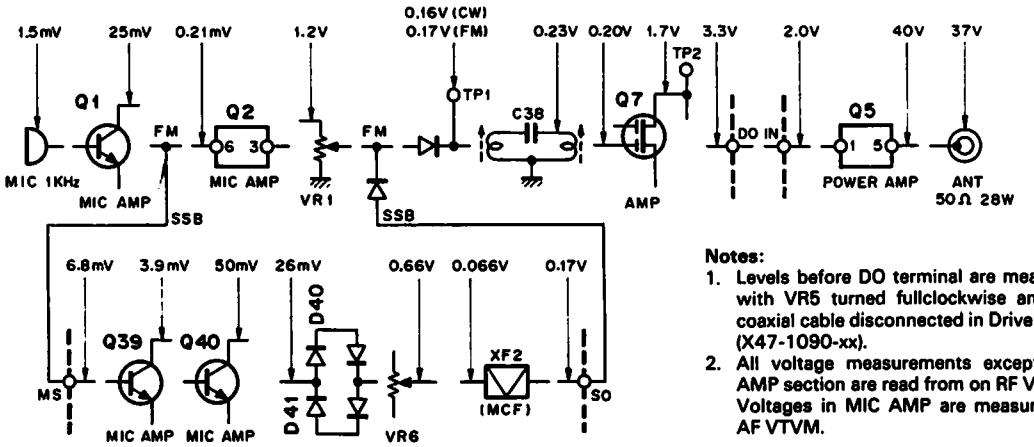
<RECEIVER SECTION>



Notes:

1. The figures shown are signal generator output required for a constant audio output with a constant AF gain control setting. Set the AF gain control for 0.63V/8Ω (50 mW) audio output. −6 dB signal generator input at 144.50 MHz (MODE: CW)
2. The figures shown in □ are signal generator output required for a constant S/N ratio with a constant AF gain control setting. −6 dB signal generator input at 144.50 MHz (MODE: FM)
3. The figures shown after the ring detector are audio output levels.
4. To inject signal generator output connect a 0.01 μF 500V capacitor between the signal generator and the check point.

<TRANSMITTER SECTION>



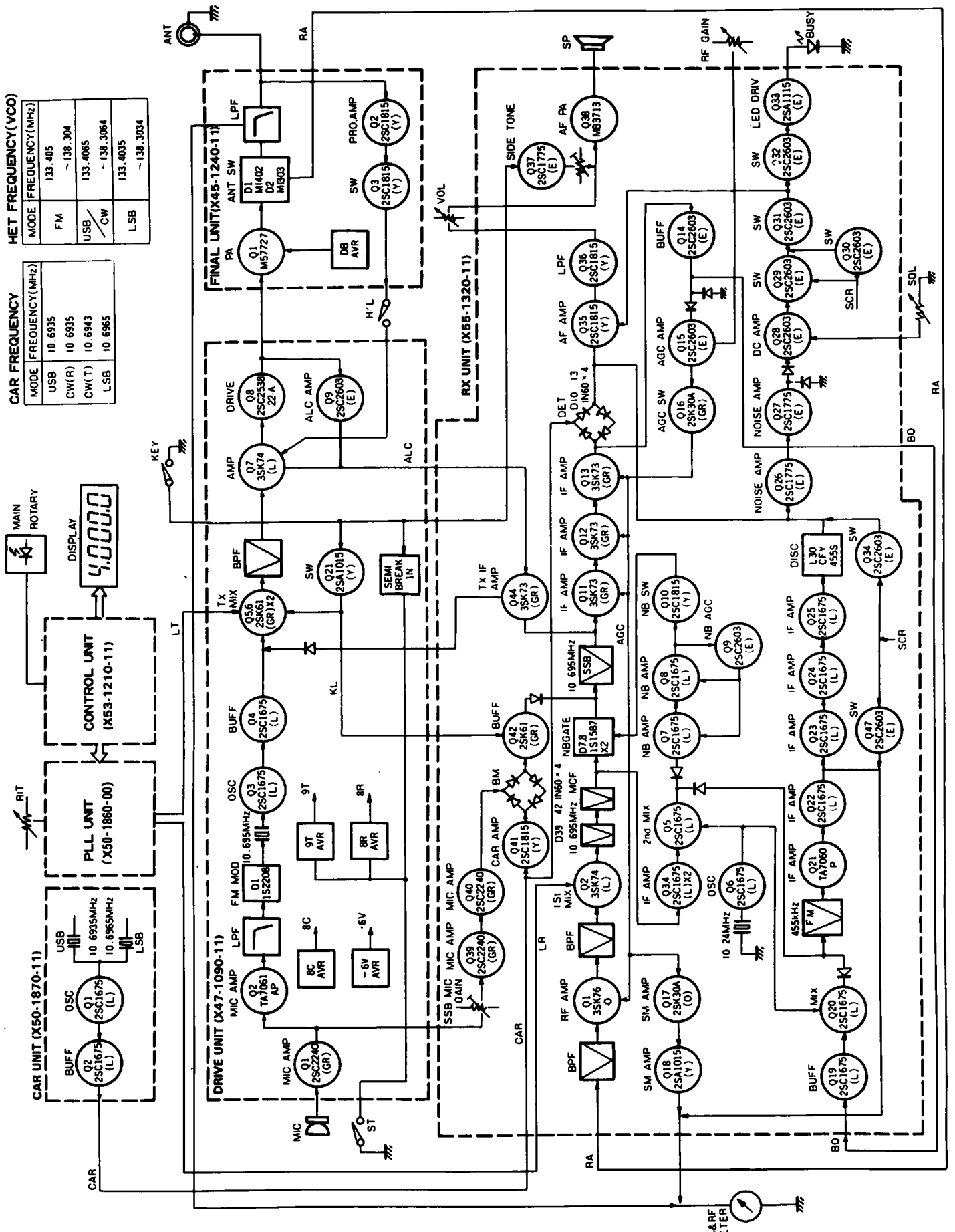
Notes:

1. Levels before DO terminal are measured with VR5 turned fullclockwise and DO coaxial cable disconnected in Drive unit (X47-1090-xx).
2. All voltage measurements except MIC AMP section are read from on RF VTVM. Voltages in MIC AMP are measured by AF VTVM.

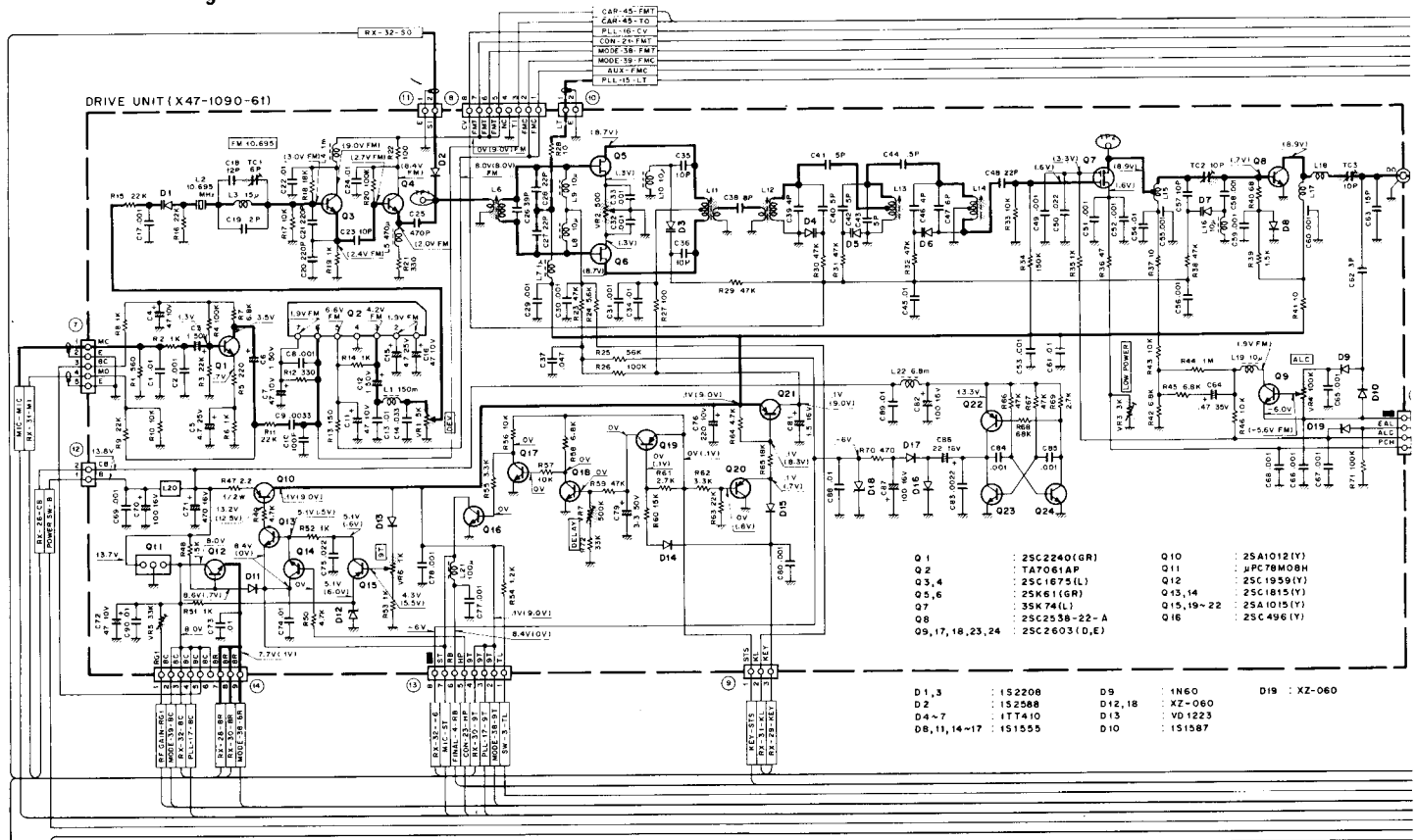
<REFERENCE>

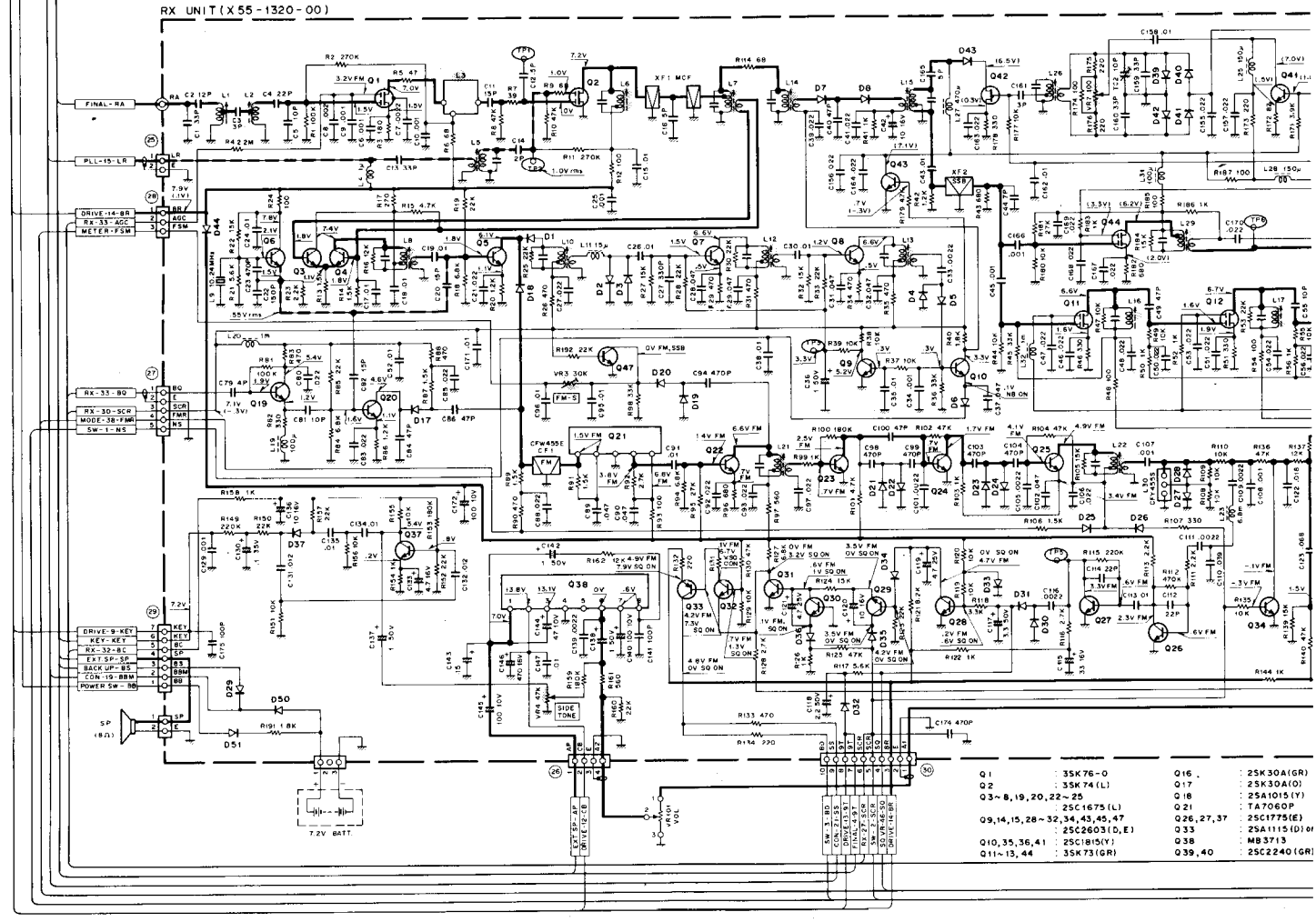
Japanese "SG"	American "SG"
−6 dB	0.25 μV
0 dB	0.5 μV
6 dB	1 μV
12 dB	2 μV
24 dB	8 μV
30 dB	15.8 μV
40 dB	50 μV
50 dB	158 μV
60 dB	500 μV
70 dB	1.58 mV
80 dB	5 mV
90 dB	15.8 mV
100 dB	50 mV
120 dB	0.5V

BLOCK DIAGRAM (K)



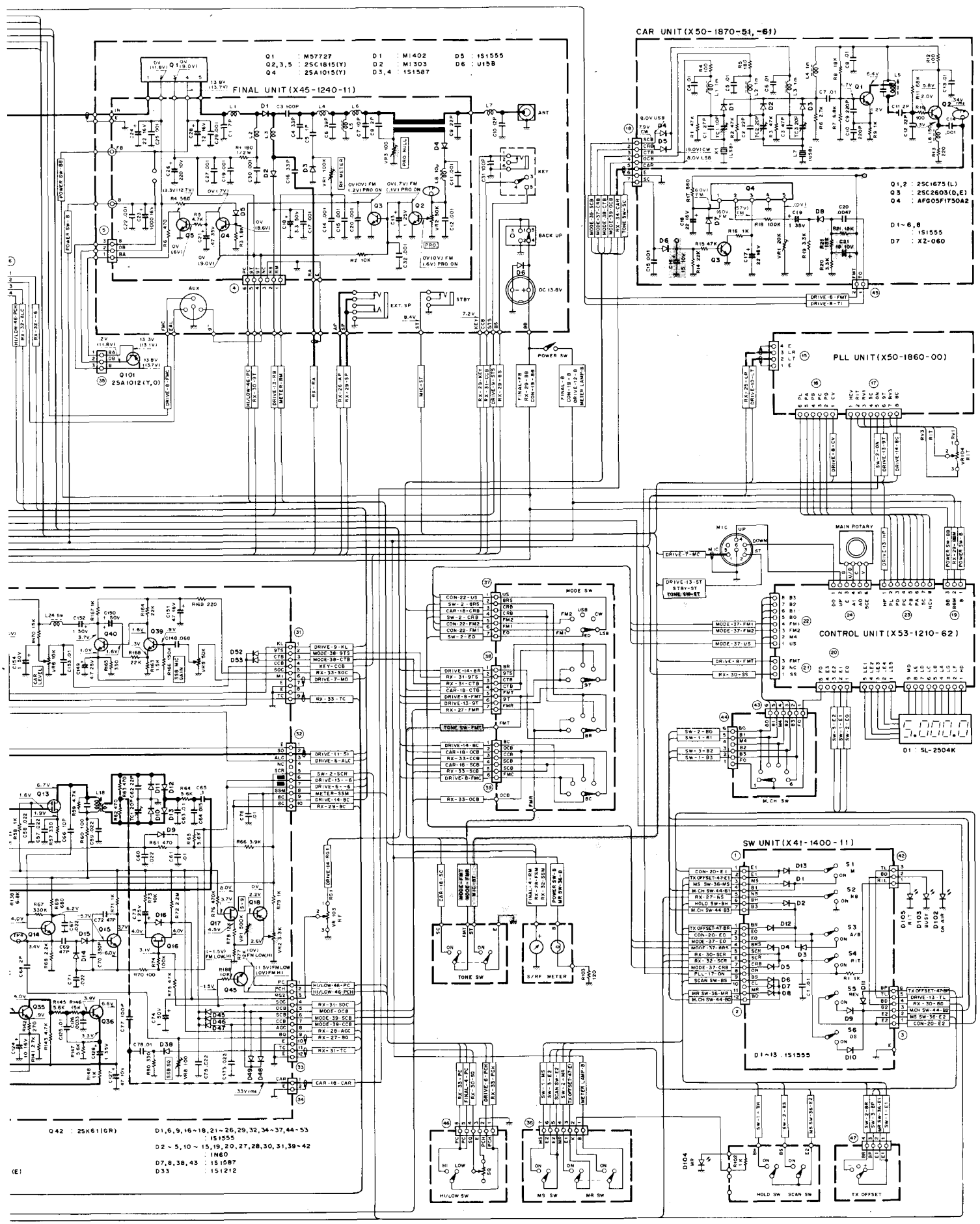
Signal line — — — Control line ——— Common DC line





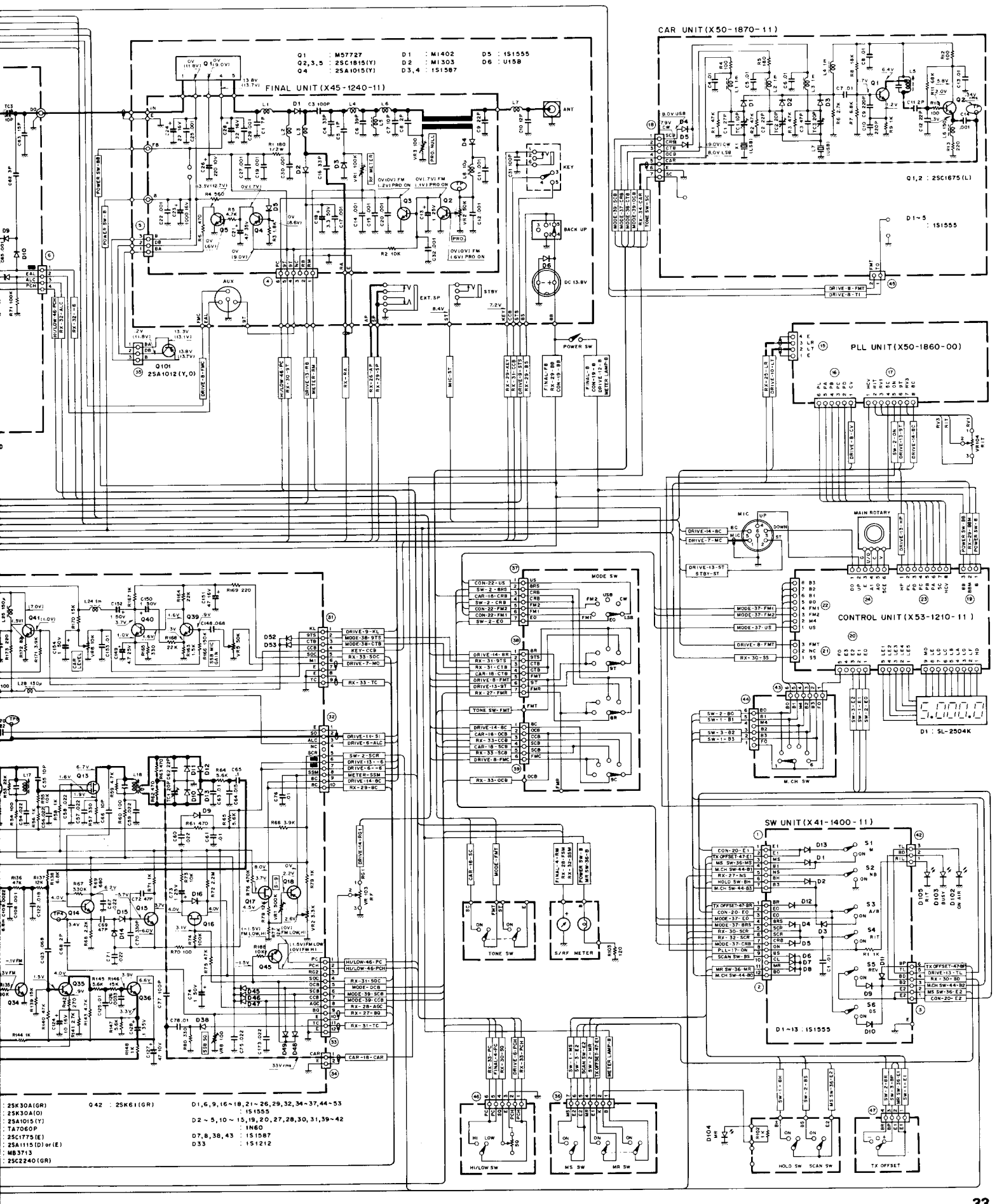
AGRAM (W, T)

Voltage measurement conditions
f = 145.000 MHz, MODE USB, RX no signal. ( ): TX



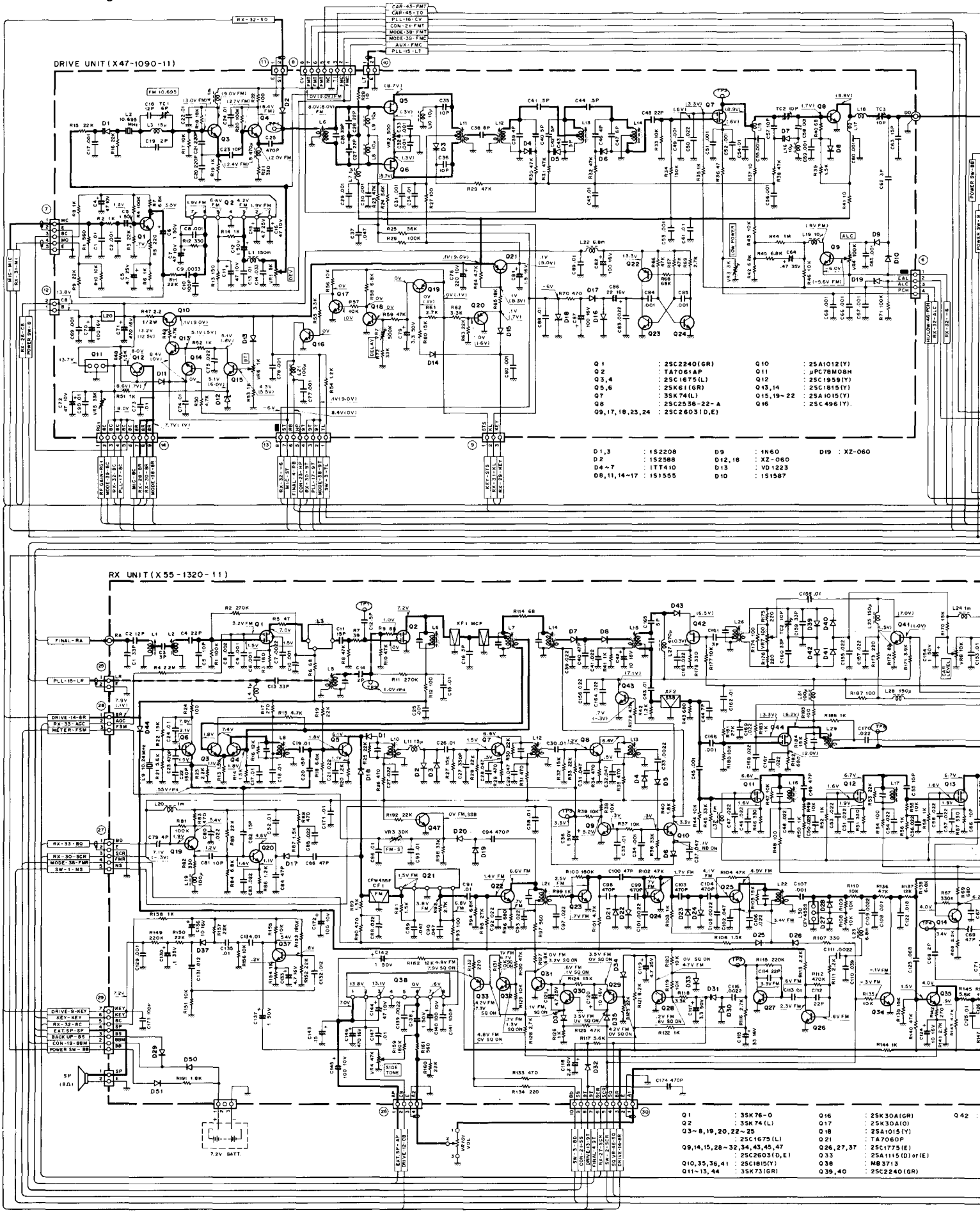
MATIC DIAGRAM (K, M)

Voltage measurement conditions
f = 145.000 MHz, MODE USB, RX no signal. ( ): TX



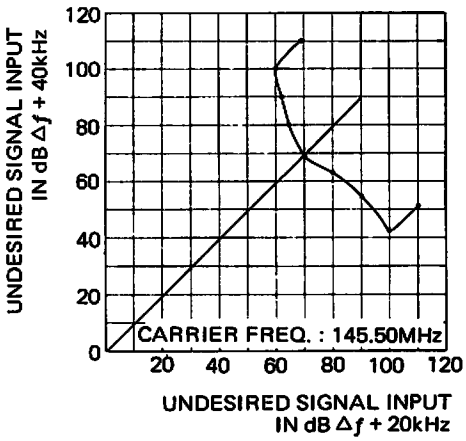
SCHEMATIC DIAG

Signal line — — — Control line ——— Common DC line

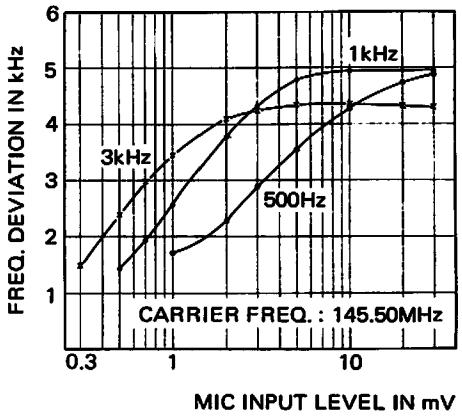


REFERENCE DATA

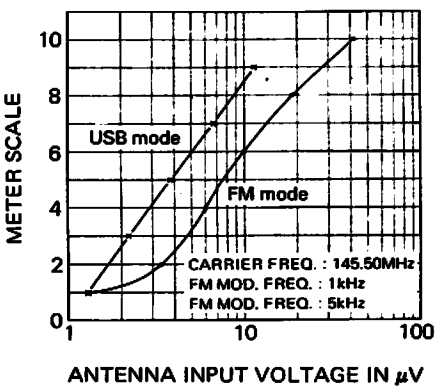
[Inter modulation] FM mode



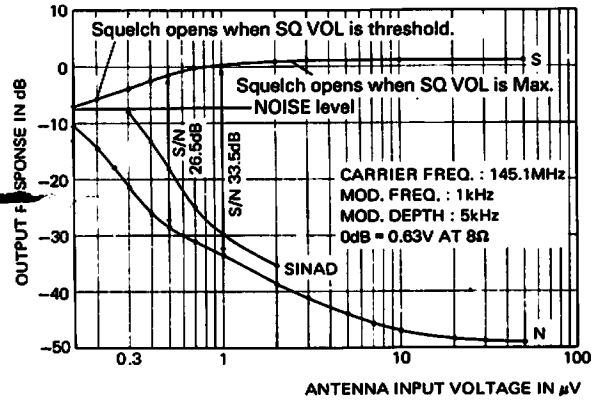
[Frequency deviation] FM mode



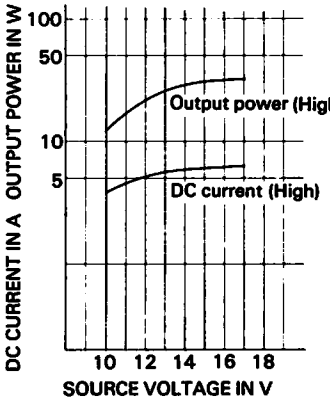
[S meter characteristics] FM and USB mode



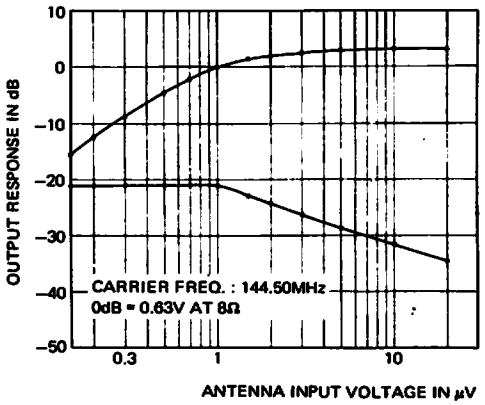
[Reception sensitivity characteristics] FM mode



[Outupt power] FM mode

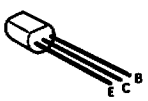


[Reception sensitivity characteristics] USB mode

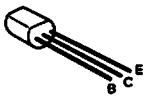


Note: ANTENNA INPUT VOLTAGE value indicates as SSG's open circuit.

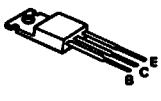
2SA1015
2SC1675 2SC1923
2SC1775 2SC1959
2SC1815 2SC2240



2SC2538-22-A

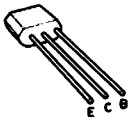


2SA1012



2SC496

2SA1115
2SC2603



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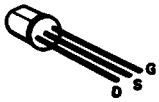
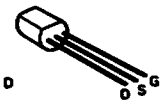


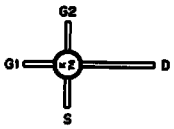
2SK30A

2SK61



3SK73

3SK74



3SK76-O

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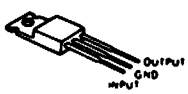
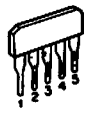
μPC78M08H



NJM78L05A

TA7060P



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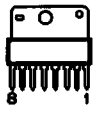
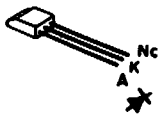
MB3713



MA522



VD1223

SLP-144B
SLP-244B

PR5532K
PY5532K

TR-9130

SPECIFICATIONS

[General]

Semiconductors	ICs	11 **K,M** 12 **W,T**
	FETs	15
	Transistors	104 **K,M** 105 **W,T**
	Diodes	124 **K,M** 126 **W,T**
Frequency range	144.000.0 to 147.999.9 MHz **K,M**	
	144.000.0 to 145.999.9 MHz **W,T**	
Frequency synthesizer	Digital control, phase locked VCO	
Mode	SSB (A3j), FM (F3), CW (A1)	
Frequency stability	Within ±500 Hz during the first hour after 1 minute of warm up, and within 50 Hz any 30 minutes thereafter at 25°C (constant).	
Power requirement	13.8V DC ± 15%	
Grounding	Negative	
Operating temperature	−20°C to +50°C	
Current drain	0.7A in receive mode with no input signal	
	6.5A in HI transmit mode (Approx.)	
	3.5A in LOW transmit mode (Approx.)	
	Less than 3.0 mA for memory back up	
Dimensions	170 mm (6-11/16″) wide	
	68 mm (2-11/16″) high	
	241 mm (9-1/2″) deep (projections not included)	
Weight	2.4 kg (5.5 lbs)	

[Transmitter Section]

RF output power (at 13.8V DC, 50Ω load)	HI (SSB, FM, CW) 25W min.	
	Low (FM, CW) 5W approx.	
Modulation	FM:	Variable reactance direct shift
	SSB:	Balanced modulation
Frequency tolerance	SSB, CW:	Less than $\pm 10 \times 10^{-6}$
	FM:	Less than $\pm 20 \times 10^{-6}$
Spurious radiation	HI:	Less than −60 dB
	LOW:	Less than −53 dB
Carrier suppression	Better than 40 dB	
Unwanted side band suppression	Better than 40 dB	
Maximum frequency deviation (FM)	±5 kHz	
Microphone	Dynamic microphone with PTT switch, 500Ω	

[Receiver Section]

Circuitry	FM:	Double conversion superheterodyne
	SSB, CW:	Single conversion superheterodyne
Intermediate frequency	1st IF:	10.695 MHz
	2nd IF (FM):	455 kHz
Receiver sensitivity	FM:	Better than 0.5 μV for 30 dB S/N
		Better than 0.25 μV **K,M**, 0.2 μV **W,T** for 12 dB SINAD
	SSB, CW:	0.25 μV **K,M**, 0.2 μV **W,T** for 10 dB S/N
Receiver selectivity	FM: (−6 dB)	More than 12 kHz **K,M**, 14 kHz **W,T**
	(−60 dB)	Less than 24 kHz **K,M**, 30 kHz **W,T**
	SSB, CW:	More than 2.2 kHz (−6 dB)
		Less than 4.8 kHz (−60 dB)
Spurious interference	Better than 70 dB	
Squelch sensitivity	0.2 μV **K,M**, 0.16 μV **W,T** (Threshold)	
Auto scan stop level	Less than 0.2 μV (Threshold)	
Audio output	More than 2.0 watts across 8 ohms load (10% dist.)	

Note: Circuit and ratings are subject to change without notice due to developments in technology.

A product of

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